Final Program

MILANO

IALCCE2023

EIGHTH INTERNATIONAL SYMPOSIUM ON LIFE-CYCLE CIVIL ENGINEERING

Politecnico di Milano

Italy | **July 2-6**, 2023

Organizing Association

iaLcce
International Association for Life-Cycle Civil Engineering

Organizing Institution

POLITECNICO MILANO 1863

PROGRAM OVERVIEW

Sunday, July 2nd, 2023

19:00 - 22:00	Welcome Reception | Rectorate Building

Monday, July 3rd, 2023

08:30 - 09:30	Opening Ceremony | Aula Magna
09:30 - 10:00	Fazlur R. Khan Plenary Lecture | Aula Magna
10:00 - 11:00	Keynote Lectures | Aula Magna

	T.0.1 Room	T.0.2 Room	T.1.1 Room	T.1.2 Room	T.1.3 Room	T.2.3 Room	B.0.1 Room	B.1.1 Room	B.2.1 Room	B.3.1 Room
TIME	MoM-1	MoM-2	MoM-3	MoM-4	MoM-5	MoM-6	MoM-7	MoM-8	MoM-9	MoM-10
11:30 - 13:00	MS: Component reuse in structures and infrastructures	MS: Vibration-based structural health monitoring, damage identification and residual lifetime estimation	SS: Climate change effects on life-cycle safety, reliability, and risk of structures and infrastructure systems	MS: Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures	MS: Assessment of existing masonry arch bridge infrastructure	SS: Monitoring of structures for informed decision making	MS: Non-deterministic model updating for structural health monitoring of existing structures	SS: Functional end-of-life framework applied to hydraulic structures	SS: Advances in performance and life-cycle design of green structural materials for a more sustainable environment	
TIME	MoA-1	MoA-2	MoA-3	MoA-4	MoA-5	MoA-6	MoA-7	MoA-8	MoA-9	MoA-10
14:30 - 16:30	GS: Life-cycle of structural materials	GS: Fatigue and damage assessment	GS: Structural strenghtening and repair	MS: Smart condition assessment of railway bridges	GS: Life-cycle safety, reliability and risk analysis	MS: Recent development IoT- and ICT-based infrastructure inspection and management	MS: Integrating life-cycle engineering concepts into community resilience and decision-support	MS: Life-cycle performance assessment of civil engineering systems	SS: Structural health monitoring and asset management of infrastructures	GS: Inspection and surveying
TIME	MoE-1	MoE-2	MoE-3	MoE-4	MoE-5	MoE-6	MoE-7	MoE-8	MoE-9	MoE-10
17:00 - 18:30	MS: Component reuse in structures and infrastructures	MS: Vibration-based structural health monitoring, damage identification and residual lifetime estimation	SS: Risk-based prioritization and monitoring of bridges for road infrastructure management in Lombardy region, Italy	MS: Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures	MS: Assessment of existing masonry arch bridge infrastructure	SS: Artificial intelligence-based life-cycle management of infrastructure systems	MS: Non-deterministic model updating for structural health monitoring of existing structures	MS: Life-cycle performance assessment of civil engineering systems	SS: Structural resilience in bridge engineering: method, theory, and practice	SS: Sustainability of steel production chain
18:30 - 19:00	IALCCE General Assembly									

Tuesday, July 4th, 2023

08:30 - 10:00	Keynote Lectures | Aula Magna

	T.0.1 Room	T.0.2 Room	T.1.1 Room	T.1.2 Room	T.1.3 Room	T.2.3 Room	B.0.1 Room	B.1.1 Room	B.2.1 Room	B.3.1 Room
TIME	TuM-1	TuM-2	TuM-3	TuM-4	TuM-5	TuM-6	TuM-7	TuM-8	TuM-9	TuM-10
10:30 - 12:30	GS: Concrete degradation and modeling	GS: BIM and DT applications	MS: Advances in life-cycle earthquake engineering	MS: Smart maintenance and AI applications	MS: Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions	MS: Life-cycle asset management and the complexity of socio-environmental-technical transitions	GS: Durability performance of materials	GS: Life-cycle cost analysis	GS: Dynamic response, system identification and structural control	MS: Resilience and sustainability of steel based hybrid building structures in the life-cycle environment
TIME	TuA-1	TuA-2	TuA-3	TuA-4	TuA-5	TuA-6	TuA-7	TuA-8	TuA-9	TuA-10
14:00 - 15:30	SS: Bridge weigh-in-motion systems and applications to structural health monitoring	SS: Durability and structural assessment of fiber reinforced strengthening materials and strengthened structures	SS: Life-cycle redundancy, robustness, and resilience indicators for aging structures and infrastructure systems under multiple hazards	MS: Smart maintenance and AI applications	SS: The process of decarbonization: from ideation to specification	SS: Life-cycle and sustainability of precast concrete structures	SS: Durability of sustainable reinforced concrete for civil engineering structures	MS: Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions	SS: Corrosion-induced structural damage and prevention measures for reinforced concrete infrastructure	SS: Shaping development planning processes for infrastructure systems under future uncertainty
TIME	TuE-1	TuE-2	TuE-3	TuE-4	TuE-5	TuE-6	TuE-7	TuE-8	TuE-9	TuE-10
16:00 - 17:30	SS: Life-cycle and sustainability performance of fastenings	MS: Advanced strengthening and retrofitting solutions for existing concrete structures	SS: Practical applications and value of advanced computational and probabilistic modelling in life-cycle engineering	SS: BIM-based sustainability considerations in infrastructure construction	MS: Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions	SS: Risk-informed life-cycle management of bridges	SS: Reinforced concrete-to-concrete interfaces: experiments and modelling	MS: Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions	SS: Durability of reinforced concrete structures and infrastructures under changing climate conditions	
19:30 - 23:30	Gala Dinner | Cascina San Carlo (Caravaggio, BG)									

Wednesday, July 5th, 2023

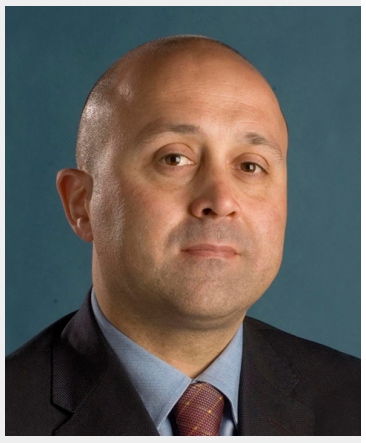
09:00 - 11:00	Keynote Lectures | Aula Magna

	T.0.1 Room	T.0.2 Room	T.1.1 Room	T.1.2 Room	T.1.3 Room	T.2.3 Room	B.0.1 Room	B.1.1 Room	B.2.1 Room	B.3.1 Room
TIME	WeM-1	WeM-2	WeM-3	WeM-4	WeM-5	WeM-6	WeM-7	WeM-8	WeM-9	WeM-10
11:30 - 13:00	SS: Concrete damage assessment using coda waves	MS: Advanced strengthening and retrofitting solutions for existing concrete structures	SS:BRIDGE|50: Experimental testing and model validation for life-cycle design and assessment of RC/PC bridges	SS:Optimization of inspection, monitoring and maintenance strategies for existing concrete structures	SS:SHM for life-cycle informed management of degrading structures	SS:Strengthening and rehabilitation of steel bridges	SS:Exploiting digitalization in the intervention planning for transportation infrastructure	GS: Assessment of infrastructure facilities	SS:Deterioration modeling of concrete, rebar, steel and bond performance	
TIME	WeA-1	WeA-2	WeA-3	WeA-4	WeA-5	WeA-6	WeA-7	WeA-8	WeA-9	WeA-10
14:30 - 16:30	SS: Use of SHM and NDE for decision making	MS: Deconstruction and reuse of steel and lightweight metal structures	GS: Experimental testing and structural modeling of bridges	GS: Seismic performance assessment	SS: Performance, safety, and cost of civil infrastructure in a life-cycle context	GS: Testing and diagnostics	MS: Safety and durability of high-performance structures	SS: Data management and analysis for predictive maintenance of aging infrastructure	GS: Life-cycle-oriented computational tools	GS: Life-cycle assessment of materials and components
16:30 - 17:00	Closing Ceremony | Aula Magna									

Thursday, July 6th, 2023

7:30 - 19:30	Post-Symposium Technical Tours

Welcome to IALCCE 2023



Fabio Biondini
Politecnico di Milano
Milan, Italy
Chair, IALCCE 2023

Dan M. Frangopol
Lehigh University
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Chair, IALCCE 2023

Structures and infrastructure systems need to comply with the continuously increasing demand from societal, political, economic, and environmental needs associated with aging, deterioration processes, and other multiple natural and human-made hazards affecting civil infrastructure facilities. To respond to these needs, civil engineering is undergoing a profound change towards a life-cycle-oriented design and maintenance philosophy where the system performance is considered as time-dependent and the desired levels of target performance are addressed over the entire life-cycle taking into account the effects of aging and deterioration processes, time-variant loadings, and maintenance and repair interventions, among others. This transition is at the heart of civil engineering and is promoting and guiding a considerable amount of research and relevant advances in the fields of modeling, analysis, design, inspection, monitoring, repair, maintenance, and rehabilitation of deteriorating civil engineering systems. To support this process, after a series of International Workshops on Life-Cycle Analysis and Design of Civil Engineering Infrastructure Systems, IALCCE - *The International Association for Life Cycle Civil Engineering* was created in 2006 (https://www.ialcce.org).

IALCCE covers all aspects of life-cycle assessment, design, maintenance, rehabilitation and monitoring of civil engineering systems. The objective of the Association is to promote international cooperation in the field of life-cycle civil engineering for the purpose of enhancing the welfare of society. Currently, IALCCE includes over 800 individual members from 66 countries and over 30 collective members. Seven International Symposia have been organized since the foundation of IALCCE. The inaugural IALCCE Symposium was held in Varenna, Lake Como, Italy, in June 2008, under the auspices of Politecnico di Milano. Following IALCCE 2008, a series of Symposia have been organized in Taipei, Taiwan (IALCCE 2010), Vienna, Austria (IALCCE 2012), Tokyo, Japan (IALCCE 2014), Delft, The Netherlands (IALCCE 2016), Ghent, Belgium (IALCCE 2018), and Shanghai, China (IALCCE 2020). These events have been very successful, both technically and academically, and IALCCE Symposia have become established events in the field of life-cycle civil engineering. It was therefore considered fruitful to continue this landmark series and celebrate the 15th Anniversary of IALCCE Symposia where they were initiated by bringing together recent advances and cutting-edge research in the field of life-cycle civil engineering and related topics at the *Eighth International Symposium on Life-Cycle Civil Engineering* (IALCCE 2023), held at Politecnico di Milano, Milan, Italy, 2-6 July, 2023 (https://ialcce2023.org).

IALCCE 2023 has been organized on behalf of IALCCE under the auspices of Politecnico di Milano. The interest of the international civil engineering community in the activities covered by IALCCE has been confirmed by the significant response to the IALCCE 2023 call for papers. In fact, over 750 abstracts from more than 50 countries were received by the Symposium Secretariat, and approximately 70% of them were selected for final publication as technical papers and presentation at the Symposium within mini-symposia, special sessions, and general sessions. Contributions presented at IALCCE 2023 cover recent advances and cutting-edge research in the field of life-cycle civil engineering, including emerging concepts and innovative applications related to life-cycle design, assessment, inspection, monitoring, repair, maintenance, rehabilitation, and management of structures and infrastructure systems under uncertainty.

Life-Cycle of Structures and Infrastructure Systems is an Open Access Book published by Taylor & Francis collecting the lectures and papers presented at IALCCE 2023. This book contains the full papers of 514 contributions, including the Fazlur R. Khan Plenary Lecture, nine Keynote Lectures, and 504 technical papers from 45 countries. It provides both and up-to-date overview of the field of life-cycle civil engineering and significant contributions to the process of making more rational decisions to mitigate the life-cycle risk and improve the life-cycle safety, reliability, redundancy, robustness, resilience, and sustainability of structures and infrastructure systems exposed to multiple natural and human-made hazards in a changing climate.

On behalf of IALCCE and Politecnico di Milano, the chairs of the Symposium would like to express their sincere thanks to the authors, the organizers of mini-symposia and special sessions, and all the participants for their contributions; to the members of the Steering Committee, International Scientific Committee, and National Advisory Committee for their role in ensuring the highest scientific level of the Symposium, and to the members of the Local Organizing Committee for the time and efforts dedicated to make IALCCE 2023 a successful event. At the institutional level, a special acknowledgment has to be given to the Politecnico di Milano, for organizing and co-sponsoring this Symposium along with the International Association for Life-Cycle Civil Engineering (IALCCE), as well as to the Department of Civil and Environmental Engineering for endorsing and supporting the Symposium organization. Finally, the chairs of the Symposium wish to thank all organizations, institutions, and authorities that offered their patronage at IALCCE 2023.

IALCCE2023

EIGHTH INTERNATIONAL SYMPOSIUM ON LIFE-CYCLE CIVIL ENGINEERING

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Advanced Technology for Large Structural Systems
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BOKU
University of Natural Resources and Life Sciences
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CISM
International Centre for Mechanical Sciences
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CTE
Italian Society of Building Engineers
Collegio dei Tecnici della Industrializzazione Edilizia
Milan, Italy

fib
The International Federation for Structural Concrete

IABMAS
International Association for Bridge Maintenance And Safety

IABMAS Italy
Italian National Group of IABMAS
International Association for Bridge Maintenance And Safety
Italy

IALCCE NL
Dutch National Group of IALCCE
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The Netherlands

JAEE
Japan Association for Earthquake Engineering

JCI
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JSCE
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International Association for Life–Cycle Civil Engineering
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SYMPOSIUM WEBSITE

https://ialcce2023.org

Symposium Information

VENUE

POLITECNICO DI MILANO
Leonardo Campus
Piazza Leonardo da Vinci, 32
20133 Milano (MI), Italy

The Secretariat Office of IALCCE 2023 will be operated from the Registration Desk located on the Ground Floor of the Building 13 – Trifoglio.

Registration Desk opening hours

Sunday, July 2nd	16:00 – 19:30
Monday, July 3rd	07:30 – 19:30
Tuesday, July 4th	07:30 – 18:00
Wednesday, July 5th	08:00 – 17:30

During the opening hours, all regularly registered participants can collect the Symposium material. Our staff will be pleased to help you with all your enquiries.

SLIDE CENTER & PRESENTATION GUIDELINES

Speakers will be NOT allowed to use their personal laptop computers for Presentations. Presentations must be uploaded in advance in the Symposium Room Network at least 24 hours prior to the start of the Session. Speakers will be NOT allowed to upload the Presentations by using the computers installed in the conference rooms. The Slide Centre is located at Ground Floor of Building 13 - Trifoglio.

Speakers are kindly required to carefully check their Presentation at the Slide Center at least 30 minutes before the Session will start. Technicians will assist Speakers to preview their Presentations to ensure that they display well on the screens. Speakers are also required to fill out the "Speaker Information Form" and deliver it to the Session Chairs at least 15 minutes before the session starts.

WI-FI

WI-FI internet access is available at the Symposium Venue. Dedicated User ID and password required for internet access are made available to all registered participants.

ON SITE REGISTRATION

Registration on site will be possible during the entire Symposium within the opening hours of the registration desk. A surcharge of 10% of processing fee will be applied to the regular registration fees posted on the Symposium website for on site registrations.

Extra tickets for Social Events

Extra ticket for Welcome Reception	€ 60
Extra ticket for Gala Dinner	€ 120

Extra tickets for Welcome Reception and Gala Dinner are subject to availability. Please check at the registration desk.

SYMPOSIUM BADGE

The participants are kindly requested to wear the Symposium badge at all times during the Symposium.

PERSONAL PROPERTY

The participants are invited to take good care of their personal belongings, and to do not leave them unattended. Neither the Symposium organizers nor their staff will be responsible for any loss or damage of the personal property of the participants.

LUNCHES & COFFEE BREAKS

Daily lunch will be served in the lunch area at Building 16C. Coffee breaks will be served at both the ground floor and first floor of Building 13 - Trifoglio.

OPENING CEREMONY

The Opening Ceremony will be held on Monday, July 3rd, from 8:30 to 9:30 in the Aula Magna of Building 13 - Trifoglio.

IALCCE GENERAL ASSEMBLY

The General Assembly of IALCCE will be held on Monday July 3rd, from 18:30 to 19:00 in the Aula Magna of Building 13 - Trifoglio.

FAZLUR R. KHAN MEDAL & IALCCE AWARDS

The Fazlur R. Khan Life-Cycle Civil Engineering Medal and the IALCCE Awards will be presented at the Gala Dinner on Tuesday, July 4th, 2023.

Fazlur R. Khan Life-Cycle Civil Engineering Medal
The Fazlur R. Khan Life-Cycle Civil Engineering Medal will be presented at IALCCE 2023. This medal was established to honor Fazlur R. Khan outstanding contributions to structural engineering in general and in particular to life-cycle civil engineering. This award is made to a member of the International Association of Life-Cycle Civil Engineering who has made definite contributions to the advancement of life-cycle civil engineering through journal or conference papers, or other written presentations.

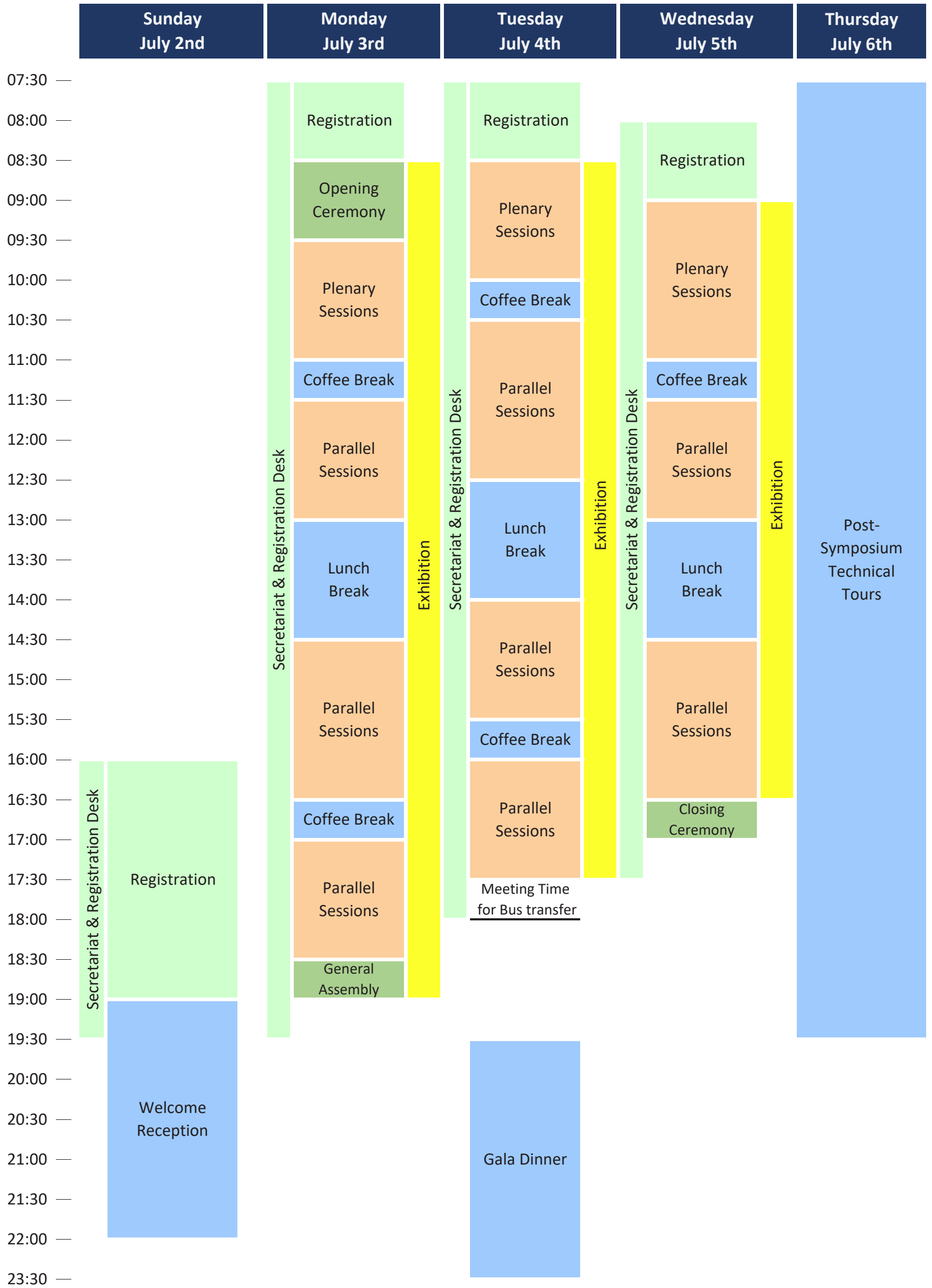
IALCCE Awards
IALCCE Awards will be presented at IALCCE 2023. The awards will be made to members of IALCCE for distinguished achievements in the areas of Life-Cycle Civil Engineering. Selections will be based on past achievements.

The IALCCE Awards Committee is chaired by Professor Hitoshi Furuta, Kansai University, Osaka, Japan.

CLOSING CEREMONY

The Closing Ceremony is scheduled on Wednesday July 5th at 16:30 in the Aula Magna of Building 13 – Trifoglio.

Symposium Overview



Scientific Program

FAZLUR R. KHAN PLENARY LECTURE

Eugen Brühwiler
Making Bridges Sustainable
Monday, July 3rd, Aula Magna

KEYNOTE LECTURES

Mark Sarkisian
Resilient structures: Materials | Components | Systems
Monday, July 3rd, Aula Magna

Mitsuyoshi Akiyama
Probabilistic life-cycle performance assessment of corroded concrete structures: Core technologies to predict the remaining service life
Monday, July 3rd, Aula Magna

Jens Sandager Jensen
Digital transition in asset management of bridges – Advantages and challenges
Tuesday, July 4th, Aula Magna

Mark Stewart
Risk and decision-making for extreme events: What terrorism and climate change have in common
Tuesday, July 4th, Aula Magna

Maddalena Carsana
Field and laboratory tests for corrosion assessment of existing concrete bridges
Tuesday, July 4th, Aula Magna

Ho-Kyung Kim
Life-cycle sea-crossing bridge operation under strong winds in severe weather
Wednesday, July 5th, Aula Magna

Robby Caspeele
Bayesian assessment of existing concrete structures: Exploiting the full power of combined information
Wednesday, July 5th, Aula Magna

Michel Ghosn
Safety assessment of civil infrastructure assets subjected to extreme events
Wednesday, July 5th, Aula Magna

Francesco Canali
The structural life of a Cathedral and the worksites of the Duomo di Milano
Wednesday, July 5th, Aula Magna

MINI-SYMPOSIA

MoM-1 & MoE-1
Component reuse in structures and infrastructures
Organized by:
Ornella Iuorio, University of Leeds
Corentin Fivet, Ecole Polytechnique Fédérale de Lausanne

MoA-4
Smart condition assessment of railway bridges
Organized by:
Túlio Bittencourt, Universidade de São Paulo
Rui Calçada, Universidade do Porto
Diogo Ribeiro, Instituto Superior de Engenharia do Porto
Hermes Carvalho, Universidade Federal de Minas Gerais
Marcos Massao, Universidade de São Paulo
Pedro Montenegro, Universidade do Porto

MoA-7
Integrating life-cycle engineering concepts into community resilience and decision-support
Organized by:
John van de Lindt, Colorado State University
Jamie Padgett, Rice University
Andre R. Barbosa, Oregon State University
Nisrine Makhoul, Politecnico di Milano

MoM-2 & MoE-2
Vibration-based structural health monitoring, damage identification and residual lifetime estimation
Organized by:
Edwin Reynders, KU Leuven
Geert Lombaert, KU Leuven
Eleni Chatzi, ETH Zurich
Costas Papadimitirou, University of Thessaly

MoA-8 & MoE-8
Life-cycle performance assessment of civil engineering systems
Organized by:
Mitsuyoshi Akiyama, Waseda University
Dan M. Frangopol, Lehigh University, ATLSS Research Center
Hiroshi Matsuzaki, National Defense Academy

TuM-4 & TuA-4 &
Smart maintenance and AI applications
Organized by:
Hitoshi Furuta, Osaka Metropolitan University
Necati Catbas, University of Central Florida
Yasutoshi Nomura, Ritsumeikan University

MoM-7 & MoE-7
Non-deterministic model updating for structural health monitoring of existing structures
Organized by:
Masaru Kitahara, Leibniz University Hannover
Matteo Broggi, Leibniz University Hannover
Michael Beer, Leibniz University Hannover
Takeshi Kitahara, Kanto Gakuin University

TuM-10
Resilience and sustainability of steel based hybrid building structures in the life-cycle environment
Organized by:
Dan Dubina, Romanian Academy
Florea Dinu, Politehnica University of Timisoara
Viorel Ungureanu, Politehnica University of Timisoara

MoA-6
Recent development IoT- and ICT-based infrastructure inspection and management
Organized by:
Chul-Woo Kim, Kyoto University
Vasilis Sarhosis, University of Leeds
Mohammad Noori, California Polytechnic State University
Yi Zhang, Tsinghua University

TuM-3
Advances in life-cycle earthquake engineering
Organized by:
Luca Capacci, Politecnico di Milano
Mitsuyoshi Akiyama, Waseda University
Fabio Biondini, Politecnico di Milano
Dan M. Frangopol, Lehigh University, ATLSS Research Center

TuM-6
Life-cycle asset management and the complexity of socio-environmental-technical transitions
Organized by:
Andreas Hartmann, University of Twente
Marcel Hertogh, Delft University of Technology
Jaap Bakker, Rijskwaterstaat
Han Roebers, Province Noord-Holland

TuE-2 & WeM-2
Advanced strengthening and retrofitting solutions for existing concrete structures
Organized by:
Norbert Randl, Carinthia University of Applied Sciences
Edoardo Rossi, Carinthia University of Applied Sciences

WeA-7
Safety and durability of high-performance structures
Organized by:
Xiang-Lin Gu, Tongji University
Qian-Qian Yu, Tongji University

MoM-4 & MoE-4
Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures
Organized by:
Giovanni Di Luzio, Politecnico di Milano
Roman Wan-Wendner, Ghent University
Mohammed Alnaggar, Oak Ridge National Laboratory
Jan Vorel, Czech Technical University

WeA-2
Deconstruction and reuse of steel and lightweight metal structures
Organized by:
Markus Kuhnhenne, RWTH Aachen University
Paul Kamrath, Paul Kamrath Ingenieurrückbau GmbH

MoM-5 & MoE-5
Assessment of existing masonry arch bridge infrastructure
Organized by:
Matthew Gilbert, University of Sheffield
Giuliana Cardani, Politecnico di Milano
Thomas Boothby, Penn State University
Dario Coronelli, Politecnico di Milano

TuA-8 & TuE-8
Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions
Organized by:
Alberto Pavese, University of Pavia
Marco Furinghetti, University of Pavia

TuM-5 & TuE-5
Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions
Organized by:
Francesco Cannizzaro, University of Catania
Nicola Cavalagli, University of Perugia
Corrado Chisari, University of Campania "Luigi Vanvitelli"
Bartolomeo Pantò, University of Durham
Fabrizio Scozzese, University of Camerino
Paolo Zampieri, University of Padua
Mattia Zizi, University of Campania "Luigi Vanvitelli"

SPECIAL SESSIONS

MoM-3
Climate change effects on life-cycle safety, reliability, and risk of structures and infrastructure systems
Organized by:
Fabio Biondini, Politecnico di Milano
Zoubir Lounis, National Research Council Canada
Michel Ghosn, The City College of New York

WeM-5
SHM for life-cycle informed management of degrading structures
Organized by:
Maria Pina Limongelli, Politecnico di Milano
Paolo Gardoni, University of Illinois at Urbana-Champaign
Sebastian Thöns, Lund University
Dagang Lu, Harbin Institute of Technology

MoM-6
Monitoring of structures for informed decision making
Organized by:
Alfred Strauss, University of Natural Resources and Life Sciences
Dan M. Frangopol, Lehigh University, ATLSS Research Center

MoE-6
Artificial intelligence-based life-cycle management of infrastructure systems
Organized by:
You Dong, The Hong Kong Polytechnic University
Dan M. Frangopol, Lehigh University, ATLSS Research Center
Xiaoming Lei, The Hong Kong Polytechnic University

WeM-1
Concrete damage assessment using coda waves
Organized by:
Christoph Gehlen, Technical University of Munich
Ernst Niederleithinger, Federal Institute for Materials Research and Testing (BAM)
Jithender Timothy, Technical University of Munich
Thomas Kränkel, Technical University of Munich

TuA-3
Life-cycle redundancy, robustness, and resilience indicators for aging structures and infrastructure systems under multiple hazards
Organized by:
Fabio Biondini, Politecnico di Milano
Dan M. Frangopol, Lehigh University, ATLSS Research Center

TuA-1
Bridge weight-in-motion systems and applications to structural health monitoring
Organized by:
Samim Mustafa, Indian Institute of Technology
Daniel Cantero, Norwegian University of Science and Technology

WeA-5
Performance, safety, and cost of civil infrastructure in a life-cycle context
Organized by:
Yaohan Li, Hong Kong Metropolitan University
Peng Yuan, The Hong Kong Polytechnic University
You Dong, The Hong Kong Polytechnic University
Dan M. Frangopol, Lehigh University, ATLSS Research Center

MoE-3
Risk-based prioritization and monitoring of bridges for road infrastructure management in Lombardy region, Italy
Organized by:
Fabio Biondini, Politecnico di Milano
Maria Pina Limongelli, Politecnico di Milano
Carmelo Gentile, Politecnico di Milano
Marco Belloli, Politecnico di Milano

WeM-3
BRIDGE|50: Experimental testing and model validation for life-cycle design and assessment of RC/PC bridges
Organized by:
Fabio Biondini, Politecnico di Milano
Francesco Tondolo, Politecnico di Torino
Sergio Manto, SCR Piemonte
Carlo Beltrami, Lombardi Engineering

WeM-9
Deterioration modeling of concrete, rebar, steel and bond performance
Organized by:
Xiangling Gao, Tongji University
Xiaodan Ren, Tongji University
Jie Li, Tongji University

WeM-7
Exploiting digitalization in the intervention planning for transportation infrastructure
Organized by:
Bryan T. Adey, ETH Zurich
Saviz Moghtadernejad, ETH Zurich
Steven Chuo, ETH Zurich
Hamed Mehranfar, ETH Zurich

WeM-6
Strengthening and rehabilitation of steel bridges
Organized by:
Xu Jiang, Tongji University
Xuhong Qiang, Tongji University
Zhilin Lv, Tongji University

WeA-8
Data management and analysis for predictive maintenance of aging infrastructure
Organized by:
Franziska Schmidt, Université Gustave Eiffel
Mezgeen Rasol, Université Gustave Eiffel
Leandro F.M. Sanchez, uOttawa

TuE-7
Reinforced concrete-to-concrete interfaces: experiments and modelling
Organized by:
Vasiliki Palieraki, National Technical University of Athens
Sara Cattaneo, Politecnico di Milano

TuE-6
Risk-informed life-cycle management of bridges
Organized by:
Ilaria Venanzi, University of Perugia
Maria Pina Limongelli, Politecnico di Milano
Umberto Alibrandi, Aarhus University

TuE-4
BIM-based sustainability considerations in infrastructure construction
Organized by:
Markus König, Ruhr-Universität Bochum

WeM-4
Optimization of inspection, monitoring and maintenance strategies for existing concrete structures
Organized by:
Robby Caspeele, Ghent University
Wouter Botte, Ghent University
Geert Lombaert, KU Leuven
Alfred Strauss, University of Natural Resources and Life Sciences

MoE-10
Sustainability of steel production chain
Organized by:
Helena Gervasio, University of Coimbra
Marta Maria Sesana, University of Brescia

MoM-9
Advances in performance and life-cycle design of green structural materials for a more sustainable environment
Organized by:
Beatrice Belletti, University of Parma
Patrizia Bernardi, University of Parma
Alice Sirico, University of Parma

TuE-9
Durability of reinforced concrete structures and infrastructures under changing climate conditions
Organized by:
Sylvia Kessler, Helmut-Schmidt-University - University of the Federal Armed Forces Hamburg
Francesca Marsili, Helmut-Schmidt-University - University of the Federal Armed Forces Hamburg
Pietro Croce, University of Pisa
Filippo Landi, University of Pisa

TuA-6
Life-cycle and sustainability of precast concrete structures
Organized by:
Bruno Dal Lago, University of Insubria
Hugo Rodrigues, Universidade do Aveiro
Paolo Negro, European Commission, Joint Research Centre

TuA-10
Shaping development planning processes for infrastructure systems under future uncertainty
Organized by:
Bryan T. Adey, ETH Zürich
Arnór Elvarsson, ETH Zürich
Orlando Román, ETH Zürich

MoM-8
Functional end-of-life framework applied to hydraulic structures
Organized by:
Evert Jan Hamerslag, Rijkswaterstaat
Esther van Baaren, Deltares
Alexander Bakker, Delft University of Technology

TuA-5
The process of decarbonization: from ideation to specification
Organized by:
David Shook, Skidmore, Owings & Merrill
Mark Sarkisian, Skidmore, Owings & Merrill

MoE-9
Structural resilience in bridge engineering: method, theory, and practice
Organized by:
Airong Chen, Tongji University
Xuhui He, Central South University
Xin Ruan, Tongji University

TuE-3
Practical applications and value of advanced computational and probabilistic modelling in life-cycle engineering
Organized by:
Paolo Bocchini, Lehigh University
Alfred Strauss, University of Natural Resources and Life Sciences
Helder Sousa, Brisa Group

WeA-1
Use of SHM and NDE for decision making
Organized by:
Nurdan M. Apaydin, Istanbul University-Cerrahpasa
F. Necati Catbas, University of Central Florida
Bruno Briseghella, Fuzhou University

TuA-2
Durability and structural assessment of fiber reinforced strengthening materials and strengthened structures
Organized by:
Francesco Micelli, University of Salento
Corina Papanicolaou, University of Patras
Bahman Ghiassi, University of Birmingham
Marianovella Leone, University of Salento

TuA-7
Durability of sustainable reinforced concrete for civil engineering structures
Organized by:
Maddalena Carsana, Politecnico di Milano
Elena Redaelli, Politecnico di Milano

MoA-9
Structural health monitoring and asset management of infrastructures
Organized by:
Shaikha AlSanad, Kuwait Institute for Scientific Research
Jafarali Parol, Kuwait Institute for Scientific Research

TuA-9
Corrosion-induced structural damage and prevention measures for reinforced concrete infrastructure
Organized by:
Shangtong Yang, University of Strathclyde
Fujian Tang, Dalian University of Technology
Weiping Zhang, Tongji University

TuE-1
Life-cycle and sustainability performance of fastenings
Organized by:
Panagiotis Spyridis, Technical University of Dortmund
Giovanni Muciaccia, Politecnico di Milano
Konrad Bergmeister, University of Natural Resources and Life Sciences
Thilo Pregartner, Fischerwerke GmbH & Co. KG
Roberto Piccinin, Hilti Corporation
Thomas Sippel, Group Corporation

GENERAL SESSIONS

WeM-8
Assessment of infrastructure facilities

TuM-2
BIM and DT applications

TuM-1
Concrete degradation and modeling

TuM-7
Durability performance of materials

TuM-9
Dynamic response, system identification and structural control

WeA-3
Experimental testing and structural modeling of bridges

MoA-2
Fatigue and damage assessment

MoA-10
Inspection and surveying

WeA-10
Life-cycle assessment of materials and components

TuM-8
Life-cycle cost analysis

MoA-1
Life-cycle of structural materials

MoA-5
Life-cycle safety, reliability and risk analysis

WeA-9
Life-cycle-oriented computational tools

WeA-4
Seismic performance assessment

MoA-3
Structural strenghtening and repair

WeA-6
Testing and diagnostics

PROGRAM SCHEDULE
MONDAY, July 3rd, 2023

08:30 - 09:30	Opening Ceremony | Aula Magna
	Welcome Speeches from Authorities
09:30 - 10:00	Fazlur R. Khan Plenary Lecture | Aula Magna **Eugen Brühwiler** | Making bridges sustainable
10:00 - 11:00	Keynote Lectures | Aula Magna
	Mark Sarkisian | Resilient structures: Materials | Components | Systems **Mitsuyoshi Akiyama** | Probabilistic life-cycle performance assessment of corroded concrete structures: Core technologies to predict the remaining service life
11:00 - 11:30	Coffee Break
11:30 - 13:00	Concurrent Technical Sessions | MoM-1 to MoM-9
	MoM-1 | T.0.1 Room | Component reuse in structures and infrastructures MoM-2 | T.0.2 Room | Vibration-based structural health monitoring, damage identification and residual lifetime estimation MoM-3 | T.1.1 Room | Climate change effects on life-cycle safety, reliability, and risk of structures and infrastructure systems MoM-4 | T.1.2 Room | Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures MoM-5 | T.1.3 Room | Assessment of existing masonry arch bridge infrastructure MoM-6 | T.2.3 Room | Monitoring of structures for informed decision making MoM-7 | B.0.1 Room | Non-deterministic model updating for structural health monitoring of existing structures MoM-8 | B.1.1 Room | Functional end-of-life framework applied to hydraulic structures MoM-9 | B.2.1 Room | Advances in performance and life-cycle design of green structural materials for a more sustainable environment
13:00 - 14:30	Lunch Break
14:30 - 16:30	Concurrent Technical Sessions | MoA-1 to MoA-10
	MoA-1 | T.0.1 Room | Life-cycle of structural materials MoA-2 | T.0.2 Room | Fatigue and damage assessment MoA-3 | T.1.1 Room | Structural strenghtening and repair MoA-4 | T.1.2 Room | Smart condition assessment of railway bridges MoA-5 | T.1.3 Room | Life-cycle safety, reliability and risk analysis MoA-6 | T.2.3 Room | Recent development IoT- and ICT-based infrastructure inspection and management MoA-7 | B.0.1 Room | Integrating life-cycle engineering concepts into community resilience and decision-support MoA-8 | B.1.1 Room | Life-cycle performance assessment of civil engineering systems MoA-9 | B.2.1 Room | Structural health monitoring and asset management of infrastructures MoA-10 | B.3.1 Room | Inspection and surveying
16:30 - 17:00	Coffee Break
17:00 - 18:30	Concurrent Technical Sessions | MoE-1 to MoE-10
	MoE-1 | T.0.1 Room | Component reuse in structures and infrastructures MoE-2 | T.0.2 Room | Vibration-based structural health monitoring, damage identification and residual lifetime estimation MoE-3 | T.1.1 Room | Risk-based prioritization and monitoring of bridges for road infrastructure management in Lombardy region, Italy MoE-4 | T.1.2 Room | Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures MoE-5 | T.1.3 Room | Assessment of existing masonry arch bridge infrastructure MoE-6 | T.2.3 Room | Artificial intelligence-based life-cycle management of infrastructure systems MoE-7 | B.0.1 Room | Non-deterministic model updating for structural health monitoring of existing structures MoE-8 | B.1.1 Room | Life-cycle performance assessment of civil engineering systems MoE-9 | B.2.1 Room | Structural resilience in bridge engineering: method, theory, and practice MoE-10 | B.3.1 Room | Sustainability of steel production chain
18:30 - 19:00	IALCCE General Assembly | Aula Magna

OPENING CEREMONY
FAZLUR R. KHAN LECTURE & KEYNOTE LECTURES

08:30 - 09:30 | Opening Ceremony | Aula Magna

Welcome Speeches from Authorities

09:30 - 10:00 | Fazlur R. Khan Plenary Lecture | Aula Magna

Chairs: Fabio Biondini, Dan M. Frangopol

Making bridges sustainable

Eugen Brühwiler

Swiss Federal Institute of Technology Lausanne (EPFL)

Lausanne, Switzerland

10:00 - 11:00 | Keynote Lectures | Aula Magna

Chairs: Fabio Biondini, Dan M. Frangopol

Resilient structures: Materials | Components | Systems

Mark Sarkisian

SOM – Skidmore, Owings & Merrill

San Francisco, CA, USA

Probabilistic life-cycle performance assessment of corroded concrete structures: Core technologies to predict the remaining service life

Mitsuyoshi Akiyama

Waseda University

Tokyo, Japan

Concurrent Technical Sessions | MoM-1 to MoM-5			11:30 - 13:00 | Monday Morning, July 3rd, 2023	
MoM-1 T.0.1 Room	**MoM-2 T.0.2 Room**	**MoM-3 T.1.1 Room**	**MoM-4 T.1.2 Room**	**MoM-5 T.1.3 Room**
Mini-Symposium:	Mini-Symposium:	Special Session:	Mini-Symposium:	Mini-Symposium:
Component reuse in structures and infrastructures	**Vibration-based structural health monitoring, damage identification and residual lifetime estimation**	**Climate change effects on life-cycle safety, reliability, and risk of structures and infrastructure systems**	**Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures**	**Assessment of existing masonry arch bridge infrastructure**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
O. Iuorio	Y. Reuland	F. Biondini	G. Di Luzio	M. Gilbert
C. Fivet	D. Anastasopoulos	M. Ghosn	R. Wan-Wendner	G. Cardani
The design and development of a demountable and reconfigurable segmented fan concrete shell flooring system *M. Nuh, J. Orr, R. Oval*	Structural damage estimation using Short-Time Fourier Transform and improved Convolution Neural Networks *C. Shi, Y. Aounes, R. Troian, D. Lemosse, H. Bai*	Framework for life-cycle tsunami risk assessment considering sea-level rise effects due to climate change *A.K. Alhamid, M. Akiyama, K. Aoki, S. Koshimura, D.M. Frangopol*	LCA assessment related to the evolution of the earthquake performance of a strategic structure *D. di Summa, A. Marcucci, M. Nicolò, F. Martignoni, A. Carrassi, L. Ferrara, N. De Belie*	Optimal strengthening of masonry arch bridges with externally bonded reinforcing layers *M. Bruggi, A. Taliercio*
Can we reuse plasterboards? *S. Kitayama, O. Iuorio*	Dynamic characteristic study of a heritage structure in Tiruchirappalli city using operational modal analysis *S. Anjuna, N. Radhakrishnan, G. George*	Life-cycle design of concrete highway bridge decks under climate change *H. Shirkhani, Z. Lounis, J. Zhang*	The influence of the expansive site of delayed ettringite formation on the anisotropy of expansion evaluated by mesoscale discrete model *M. Fujishima, T. Miura, H. Nakamura*	Static and seismic assessment of Ponte delle Capre, a masonry arch bridge *F. Casarin, S. Bellin, M. Mocellini, R. Fabris*
Re-use of existing load-bearing structural components in new design *R.P.H. Vergoossen, G.J. van Eck, D.H.J.M. Jilissen*	Pre-posterior effectiveness of modal extraction techniques for vibrational tests design *A. Lotti, D. Tonelli, S. Zorzi, D. Zonta, E. Tubaldi*	Climatic design data for buildings and infrastructure under changing climate in Canada *H. Shirkhani, Z. Lounis*	Chemo-physics and mechanics of RC for behavioral simulation in micro-seconds to years *K. Maekawa, K. Iwama, Y. Takahashi*	Damage accumulation in the structural life and assessment of masonry bridges *T. E. Boothby, D. Coronelli*
Quality assurance process for reuse of building components *A. Räsänen, J. Lahdensivu*	Indirect bridge damage detection using frequencies identified from vibrations of a single two-axle vehicle *Z. Li, W. Lin, Y. Zhang*	Life-cycle structural reliability of RC bridge piers under corrosion in a changing climate *G.V. Nava, L. Capacci, F. Biondini, L. Casti*	Temperature dependent modelling approach for early age behavior of printable mortars *A. Robens-Radermacher, J.F. Unger, A. Mezhov, W. Schmidt*	Three-dimensional limit analysis of barrel arch bridges *D. Coronelli, M.C. Giangregorio*
Calculating embodied carbon for reused structural components with laser scanning *B.S. Byers, M. Gordon, C. De Wolf, O. Iuorio*	Small-scale damage detection of bridges using machine learning techniques and drive-by inspection methods *Y. Lan, Z. Li, Y. Zhang, W. Lin*	Risk based life-cycle planning for flood-resilient critical infrastructure *S. Skaric Palic, I. Stipanovic, E. Ganic, M. Kosic, A. Anzlin, M. Bacic, M.S. Kovacevic, K. Gavin*	Experimental study on effect of winter curing conditions on mechanical properties of concrete *F.-L. Li, W.-L. Lu, W.Q. Peng, Y.-D. Tang, L.-F. Xu*	The Reinforced Arch Method for the life of the ancient bridge of Omegna *L. Jurina, E. O. Radaelli, D. Coronelli*
Reuse of existing reinforced concrete beams: exploration of residual mechanical characteristics and measure of environmental impact *A. Lachat, A. Feraille, T. Desbois, A.S. Colas*	Structural health monitoring of the KW51 bridge based on detailed strain mode shapes: environmental influences versus simulated damage *D. Anastasopoulos, K. Maes, G. De Roeck, G. Lombaert, E.P.B. Reynders*	Equitable climate adaptation framework for levees *A. Mohammed, F. Vahedifard*	Hygro-thermo-chemo-mechanical coupled discrete model for the self-healing in Ultra High Performance Concrete *A. Cibelli, L. Ferrara, G. Di Luzio*	Numerical investigation of 3D response characteristics of masonry bridges by detailed mesoscale masonry models *M. S. El Ashri, S. Grosman, L. Macorini, B. A. Izzuddin*

Concurrent Technical Sessions | MoM-6 to MoM-10				11:30 - 13:00 | Monday Morning, July 3rd, 2023
MoM-6 T.2.3 Room	**MoM-7 B.0.1 Room**	**MoM-8 B.1.1 Room**	**MoM-9 B.2.1 Room**	**MoM-10 B.3.1 Room**
Special Session:	Mini-Symposium:	Special Session:	Special Session:	
Monitoring of structures for informed decision making	**Non-deterministic model updating for structural health monitoring of existing structures**	**Functional end-of-life framework applied to hydraulic structures**	**Advances in performance and life-cycle design of green structural materials for a more sustainable environment**	
Chairs:	Chairs:	Chairs:	Chairs:	
A. Strauss	M. Kitahara	A. Bakker	B. Belletti	
D.M. Frangopol	M. Broggi	E. van Baaren	P. Bernardi	
Recent progress developing a rating framework for evaluating SHM for bridge scour *P.J. Vardanega, G. Gavriel, M. Pregnolato*	System identification and damage assessment of benchmark model H *G.S. Wang, C.W. Lo, F.K. Huang*	Embedding functional performance in asset management of hydraulic structures *E.J.F. Hamerslag, A.M.R. Bakker*	Use of coarse recycled concrete aggregates and vitrified MSW ash in eco-concrete design *P. Plaza, C. Medina, A. Sirico, B. Belletti, P. Bernardi, J. Sánchez*	
Predicting the usefulness of monitoring information for structural evaluations of bridges *N. Bertola, E. Brühwiler*	Updating simplified jack-up model using basin test data *J.X. Cao, S.T. Quek, S.L. Zhang, C. Zhang, M.B. Cai, M. Si*	Assessing the functional end of life of critical hydraulic structures in the Netherlands *A.M.R. Bakker, E.S. van Baaren, E.J.F. Hamerslag, C.J.J. Bodelier*	Vitrified beads as aggregate replacement for sustainable cementitious materials *B. Belletti, P. Bernardi, S. Ravasini, A. Sirico, D. Milanese, C. Sciancalepore, M. Malavasi, A. Cortese*	
Monitoring and Data Informed Approaches for the Condition Assessment of Existing Structures *E. Apostolidi, M. Granzner, A. Strauss, R. Geier*	Applicable schemes for the Vehicle-Bridge Interaction System Identification method *K. Yamamoto, R. Shin*	Framework functional performance hydraulic structures *E.S. van Baaren, J. Breedeveld, N.J.M. ten Harmsen van der Beek, T. O'Mahoney, N. Kramer, H. Berger, A. Barneveld*	Mechanical strength and environmental sustainability of EAF concrete *F. Faleschini, D. Trento, M. A. Zanini, C. Pellegrino, V. Ortega-López, A. Santamaria*	
A novel low-cost inclinometer sensor based on fusion technology for structural health monitoring applications *M. Komary, A. Alahmad, S. Komarizadehasl, J. Turmo, J. A. Lozano-Galant, Y. SUN*	Evaluating the minimum cross-section thickness of a conveyor support structure member *Y. Yang, D. Ogawa, T. Nagayama, S. Kato, K. Hisazumi, T. Tominaga*	Determining the future functional requirements of a pumping-weir station with the help of data-analysis *L. van Gijzen, A.M.R. Bakker*	Sustainable design of lightened reinforced concrete flat slabs in coastal environment *A.J. Sánchez-Garrido, I.J. Navarro, V. Yepes*	
Sensor monitoring for engineering structures: applications to tunnels *A. Strauss, F. Sattler, B. Täubling-Fruleux, C. Seywald, H. Neuner, V. Kostjak, D. M. Frangopol*	Efficient posterior estimation for stochastic SHM using transport maps *J. Grashorn, M. Broggi, L. Chamoin, M. Beer*	Using the USGS database to study parameter uncertainty when assessing pier scour using the HEC-18 framework *G. Gavriel, M. Pregnolato, P.J. Vardanega*	Sustainable reuse of public real estate assets meeting structural, conservation and territorial needs *G. Concu, D.R. Fiorino, E. Pilia*	
Digital twins for bridges – concept of a modular digital twin based on the linked data approach *T. Zinke, S. Reymer, S. Kosse, P. Hagedorn, M. König, F. Wedel, S. Schneider, S. Marx, S. Nieborowski, S. Windmann*	Application of unscented transformation for Bayesian updating *T. Shuku, T. Kitahara*	Flood vulnerability index (FVI) of infrastructures for reducing adverse flood events *M. Q. Tran, H.S. Sousa, E. Texeira, J.C.Matos*	Using monetization to harmonize life-cycle assessment and life-cycle cost analysis for green public procurement of pavement projects *B. Moins, D. Hernando, W. Van den bergh, A. Audenaert*	

Concurrent Technical Sessions | MoA-1 to MoA-5				14:30 - 16:30 | Monday Afternoon, July 3rd, 2023
MoA-1 T.0.1 Room	**MoA-2 T.0.2 Room**	**MoA-3 T.1.1 Room**	**MoA-4 T.1.2 Room**	**MoA-5 T.1.3 Room**
General Session:	General Session:	General Session:	Mini-Symposium:	General Session:
Life-cycle of structural materials	**Fatigue and damage assessment**	**Structural strenghtening and repair**	**Smart condition assessment of railway bridges**	**Life-cycle safety, reliability and risk analysis**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
Z. Lounis	H. Roebers	M. Sassu	T. Bittencourt	S.M.C. Diniz
M. Lepech	G. Fiorillo	J.M. Bairan	R. Calçada	L. Casti
Powder wastes from concrete recycling as a sustainable source of calcium carbonate mineral admixture *K.M. Masunaga, T. Iyoda*	The probabilistic fatigue life of plain concrete under low-frequency stress reversal loading *E.C. Ferreira, P.Sotoudeh, G. Fiorillo, D. Svecova*	Shear strength assessment of FRP pre-tensioned concrete beams *A. Marí, E. Oller, J. Murcia-Delso, J. M. Bairán, N. Duarte*	A monitoring based digital twin for the Filstal bridges *A. Lazoglu, H. Naraniecki, I. Zaidman, S. Marx*	Foundation for risk-based asset management for storm surge barriers *Y. Kharoubi, M. van den Boomen, M.J.C.M. Hertogh, J. van den Bogaard*
Attack of aggressive carbon dioxide on hardened Portland and blast furnace slag cement paste *F. Wagemann, F. Schmidt-Döhl, A. Rahimi*	Crack growth suppression effect of SFRC overlay for root-deck fatigue in orthotropic steel deck *M. J. B. Uaje, J. Murakoshi*	Lessons learned from highway tunnels inspection, analysis, assessment and refurbishment works *A. Damiani, E. Crippa, M. Rabbia*	An application of drive-by approach on a railway Warren bridge *L. Bernardini, A. Collina, C. Somaschini, K. Matsuoka, M. Carnevale*	Assessing highway bridge scour reliability and risk under changing floods *N. Devineni, M. Ghosn*
Influence of different coarse aggregate types on porosity and various properties in concrete *N. Matsuda, T. Iyoda*	Deterministic and probabilistic damage calculation of offshore wind turbines considering the low-frequency fatigue dynamics *N. Sadeghi, P. D'Antuono, K. Robbelein, N. Noppe, W. Weijtjens, C. Devriendt*	Shear strength investigation of carbon fiber reinforced polymer strips-wrapped concrete beams with regression analysis and experiments *P. Fan, H.F. He, S.S. Cheng, S.S Guo, C. Liu*	Optimal design and application of 3D printed energy harvesting devices for railway bridges *J.C. Cámara-Molina, A. Romero, P. Galvín, E. Moliner, M.D. Martínez-Rodrigo*	Time-variant reliability analysis of corroded steel girder *Y. Wang, W. Wang, C.Q. Li, W. Yang*
Experimental study on constitutive law of stainless steel under multiaxial stress *E. Horisawa, K. Sugiura, Y. Kitane, Y. Goi*	M-integral applied to fatigue life prediction in notched elastic-plastic material *Z.J. Zhang, Q. Li*	Effects of structural rehabilitation on modal parameters of the Marlo Bridge *B. Siedziako, T.S. Nord, A. Fenerci*	Smart condition monitoring of a steel bascule railway bridge *J. Nyman, P. Rosengren, P. Kool, R. Karoumi, J. Leander, H. Petursson*	Multi-risk analysis methodology for evaluating climate change impacts at different scales *F. V. De Maio, R. Valsecchi, S. Osmani, C. Solari, P. Basso*
Influence of various admixture materials on pore structure and mass transfer characteristics *R. Yahiro, T. Iyoda*	Digital fatigue test of rib-to-deck welded joint details in orthotropic steel deck *P. Y. Li, C. S. Wang, Y. Li, D. D. He*	Seismic and energetic renovation of existing masonry buildings by innovative FRLM composite materials *D. Pugliese, V. Alecci, S. Galassi, A. M. Marra, M. De Stefano*	A Bayesian bridge model update with complex uncertainty under high-speed train passages *K. Matsuoka, D. Mizutani, C. Somaschini, L. Bernardini, A. Collina*	Effect of concrete age on the reliability of existing reinforced concrete columns *L.C.R. Castro, S.M.C. Diniz*
Continued	*Continued*	*Continued*	*Continued*	*Continued*

Concurrent Technical Sessions | MoA-1 to MoA-5 — 14:30 - 16:30 | Monday Afternoon, July 3rd, 2023

MoA-1 T.0.1 Room	MoA-2 T.0.2 Room	MoA-3 T.1.1 Room	MoA-4 T.1.2 Room	MoA-5 T.1.3 Room
General Session:	General Session:		Mini-Symposium:	General Session:
Life-cycle of structural materials	**Fatigue and damage assessment**		**Smart condition assessment of railway bridges**	**Life-cycle safety, reliability and risk analysis**
Chairs:	Chairs:		Chairs:	Chairs:
Z. Lounis	H. Roebers		T. Bittencourt	S.M.C. Diniz
M. Lepech	G. Fiorillo		R. Calçada	L. Casti
Continued	*Continued*		*Continued*	*Continued*
Multi-criteria assessment of reinforced limestone powder concrete slabs and columns *A. Radović, H. Hafez, N. Tošić, S. Marinković, A. De la Fuente*	Fatigue performance simulation of UHP-FRC composited deck for steel truss girder bridge *C.H. Zhu, L. Duan, C.S. Wang, P.Y. Li, Z. Kang, J. Kang*		Computational analysis of a reinforced concrete railway bridge considering the soil-structure interaction *A.L. Gamino, R.R. Santos, T.N. Bittencourt, M.M. Futai, H. Carvalho*	Semi-probabilistic methods for the assessment of existing concrete structures: An overview *L. Casti, F. Schmidt, F. Biondini, N. Makhoul*
Chloride-attack fragility curve: the probability of failure is estimated at a life expectancy *J. H. Kim, T. H. Han, D. J. Jeong*	Digital fatigue test of flange-web welded details in guideway girders *C. S. Wang, X. G. Zhou, Y. Z. Wang, M. Y. Yang*		Drive-by damage detection methodology for high-speed railway bridges applying Mel-frequency cepstral coefficients *E. F. Souza, T. N. Bittencourt, I. Ames, D. Ribeiro, H. Carvalho*	Risk-based prioritization of earthquake performance of RC buildings in Turkey by rapid visual screening *M. Özdemir*
The economic evaluation method of a foamed ceramics external wall panel based on full life-cycle theory *Z.W. Cao, H.B. Fang, L. Tian*	Fatigue assessment of complex welded connection in the large-span steel truss suspension bridge *G. Y. Xie, S. L. Ding, H. J. Liu, C. S. Wang*		Evaluation of corroded reinforced concrete railway bridge subjected to concrete cracking under uncertainty *L.S. Moreira, T.N. Bittencourt, M. M. Futai, H. Carvalho*	
			Structural reliability analysis of vehicle-bridge interaction based dynamic response for a high-speed railway bridge *I. Ames, T.N. Bittencourt, M.M. Futai, A.T. Beck, E.F. Souza*	

Concurrent Technical Sessions | MoA-6 to MoA-10 — 14:30 - 16:30 | Monday Afternoon, July 3rd, 2023

MoA-6 T.2.3 Room	MoA-7 B.0.1 Room	MoA-8 B.1.1 Room	MoA-9 B.2.1 Room	MoA-10 B.3.1 Room
Mini-Symposium:	Mini-Symposium:	Mini-Symposium:	Special Session:	General Session:
Recent development IoT- and ICT-based infrastructure inspection and management	**Integrating life-cycle engineering concepts into community resilience and decision-support**	**Life-cycle performance assessment of civil engineering systems**	**Structural health monitoring and asset management of infrastructures**	**Inspection and surveying**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
C. Kim	J. van de Lindt	M. Akiyama	S. AlSanad	Y. Tsompanakis
V. Sarhosis	N. Makhoul	H. Matsuzaki	A. de Boer	C. Beltrami
A computer vision-based identification of natural frequency of a pole structure and damage detection *D. Kawabe, C.W. Kim*	Resilience and the use of life-cycle cost analysis in civil engineering in the US *T. Neimeyer, B. Parsons, L. Champion, A. Kane, L. Orsenigo*	Structural reliability assessment of RC shield tunnels with nonuniform steel corrosion *Z. He, C. He*	Measuring heavy traffic using alternative systems in an urban environment *M.L. Soudijn, S. van Rossum, A. de Boer*	Port facilities asset management: coping with aging infrastructure and constrained budgets on the long term *H.Voogt*
A framework for digital twinning of masonry arch bridges *I.B. Muhit, D. Kawabe, D. Loverdos, B. Liu, Y. Yukihiro, C-W. Kim, V. Sarhosis*	The value of multi-criteria decision analysis for asset management *J. Bödefeld, F. Marsili*	Life-cycle analysis of aging structures based on reliability approach *S. Joshi, A.Thorat, H. Dehadray, M. Tundalwar*	Improving the resolution and accuracy of low-cost arduino-based accelerometers *S. Komarizadehasl, G. Ramos, J. Turmo, J. A. Lozano-Galant, V. Torralba, M. Haiying*	Guided tour of the pathological manifestations found at Rossio's historical train station *C. Carvalho, N. Bento, A. Silva*
Quality analyses of crowdsourced smartphone trips for bridge dynamic monitoring *T.J. Matarazzo, I. Dabbaghchian, L. Cronin, S.N. Pakzad, S.S. Eshkevari, H. Yin, R. Lassman, P. Santi, C. Ratti*	Toward enhancing community resilience: life-cycle resilience of structural health monitoring systems *N. Makhoul, R. Kromanis*	Baseline digital twin models for key performance management of prefabricated bridges *C.S. Shim, G.T. Roh, M.U. Kang, Y.H. Lee*	Preventive SHM for asset management: a case study on the Mont-Blanc tunnel *F.B. Cartiaux, B. Prudhomme*	Value of Information for a rational experimental and testing budget applied to a regional old Italian bridges database *I. Vangelisti, C. Beltrami*
Remote ambient vibration-based scour monitoring system *S. Kitagawa, H. Yano, C.W. Kim, D. Kawabe*	The life-cycle of a community for physical-social interdependent resilience impacted by policy decisions following tornado hazards *W. Wang, J.W. van de Lindt, S. Hamideh, E. Sutley*	Analysing the impact of local factors on the life-cycle of metallic bridge girders *G. Calvert, M. Hamer, L. Neves, J. Andrews*	Characteristics of ultrasonics guided waves in timbers under moisture and temperature *R. Yassine, S. Mustapha*	Big data in construction project management: The colombian northeast case *S. Zabala-Vargas, M. Jiménez-Barrera, L. Vargas-Sánchez, M. Jaimes-Quintanilla*
The ratio of stress amplitudes between two directions around welded part of trough rib in orthotropic decks with fatigue cracks *R. Saita, M. Ueno, Y. Sugimoto, H. Onishi*	Impact of modeling uncertainty on seismic life-cycle cost analysis of RC building under mainshock-aftershock sequences *S. P. Rayjada, J. Ghosh, M. Raghunandan*	Seismic demand hazard assessment for RC bridges considering cumulative damage over time *D. Herrera, D. Tolentino*	Asset management – Towards adaptive resilient infrastructures *S. AlSanad, J. Parol*	Visual inspection of bridges and tunnels in Italy: by experience made with different owners and methods to a new proposal for a better and more efficient inspection procedures *R. Salomone, F. Damiani, M. Vittone, M. Scarsi Napolitano, I. Vangelisti, G. Giacalone, A. Bombace, M. Brescia, M. Rabbia, C. Beltrami*
Continued	*Continued*	*Continued*	*Continued*	*Continued*

Concurrent Technical Sessions | MoA-6 to MoA-10 — 14:30 - 16:30 | Monday Afternoon, July 3rd, 2023

MoA-6 T.2.3 Room	MoA-7 B.0.1 Room	MoA-8 B.1.1 Room	MoA-9 B.2.1 Room	MoA-10 B.3.1 Room
Mini-Symposium:	Mini-Symposium:	Mini-Symposium:	Special Session:	General Session:
Recent development IoT- and ICT-based infrastructure inspection and management	**Integrating life-cycle engineering concepts into community resilience and decision-support**	**Life-cycle performance assessment of civil engineering systems**	**Structural health monitoring and asset management of infrastructures**	**Inspection and surveying**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
C. Kim	J. van de Lindt	M. Akiyama	S. AlSanad	Y. Tsompanakis
V. Sarhosis	N. Makhoul	H. Matsuzaki	A. de Boer	C. Beltrami
Continued	*Continued*	*Continued*	*Continued*	*Continued*
Ambient-vibration-based operational modal analysis and cable tension estimation in the long-term SHM of a cable-stayed bridge *W.J. Jiang, C.W. Kim, K. Ono*	Sensitivity analysis on resilience components throughout the life-cycle of an asset *N. K. Stamataki, D. V. Achillopoulou*	Development of maintenance systems for bridge members *K. Kwon, Y. Choi, J.S. Kong*	Infrastructure asset management and the role of structural health monitoring *A. AlBanwan, A. AlFoudari, R. AlBehbehani*	Inspection of highway retaining walls and geotechnical sites, state of the art in Italy and possible proposals for improving procedures and effectiveness *M. Scarsi Napolitano, D. Bonassi, R. Morè, C. Beltrami*
Uncertainty quantification of modal properties using half year monitoring data of a plate girder bridge *Y. Goi, C.W. Kim*	A Markovian framework to model life-cycle consequences of infrastructure systems in a multi-hazard environment *K. Otárola, L. Iannacone, R. Gentile, C. Galasso*	Durability analysis and optimization of a prestressed concrete bridge strengthened by a fiber reinforced concrete layer *S. Schoen, P. Edler, G. Meschke, S. Freitag*	Health monitoring of long-span bridges using deep learning driven by sensor measured and numerical response data *Z. Xue, W. Sebastian, D. D'Ayala*	A multi-phase survey approach for post-tensioned prestressed concrete bridge decks *I. Mazzatura, S. Caprili, W. Salvatore, A. Lupoi, A. Ficociello*
Study on estimation of reaction force based on vibration measurement of girders *I. Kim, S. Watanabe, Y. Goi, Y. Kitane, K. Sugiura, N. Okubo*	Integrating life-cycle analysis into civil infrastructure resilience decision making: Illustrative application to seismic resilience modeling of US communities *M. Roohi, J. Li, J. W. van de Lindt*	Quantifying the effects of long duration ground motions on the lifetime seismic losses of aging highway bridges *S. Shekhar, B. Panchireddi, J. Ghosh*	Fundamental experiments for monitoring water leakage of underground structures using plastic optical fibers *H. Zhang, Z. Liu, X. Ma, J. Qian, S. Akutagawa*	Inspection and assessment of PT structures: results from application to an existing bridge *I. Mazzatura, S. Caprili, W. Salvatore, J. R. Casas, M. Gammino, F. Ferrari, A. Piscini*
Change in vibration characteristics of steel poled structure with damage *M. Kato, Y. Goi, Y. Kitane, K. Sugiura, Y. Adachi*	Smart resilience: capturing dynamic, uncertain and evolving life-cycle conditions *R. Rincon, J.E. Padgett*			

Concurrent Technical Sessions | MoE-1 to MoE-5 — 17:00 - 18:30 | Monday Evening, July 3rd, 2023

MoE-1 T.0.1 Room	MoE-2 T.0.2 Room	MoE-3 T.1.1 Room	MoE-4 T.1.2 Room	MoE-5 T.1.3 Room
Mini-Symposium:	Mini-Symposium:	Special Session:	Mini-Symposium:	Mini-Symposium:
Component reuse in structures and infrastructures	**Vibration-based structural health monitoring, damage identification and residual lifetime estimation**	**Risk-based prioritization and monitoring of bridges for road infrastructure management in Lombardy region, Italy**	**Coupled chemical, physical, and mechanical processes in cementitious materials for short- and long-term behavior of R.C. and P.C. structures**	**Assessment of existing masonry arch bridge infrastructure**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
C. Fivet	D. Anastasopoulos	F. Biondini	R. Wan-Wendner	D. Coronelli
O. Iuorio	Y. Reuland	M.P. Limongelli	G. Di Luzio	T. Boothby
Designing with recovered precast concrete elements *T.S.K. Lambrechts, F.J. Mudge, S.N.M. Wijte, P.M. Teuffel*	Dissipated hysteretic energy reconstruction for high-resolution seismic monitoring of instrumented buildings *M. Roohi, E. M. Hernandez, D. V. Rosowsky*	Static monitoring of a masonry arch bridge: evaluating the effects of changing environment *P. Borlenghi, C. Gentile, M. D'Angelo, F. Ballio*	Crack healing under sustained load in concrete: an experimental/numerical study *G. Di Luzio, A. Cibelli, S.M.J. Al-Obaidi, S.M.I. Radwan, M. Davolio, L. Ferrara, R. Wan-Wendner, Y. Wang*	Experimental investigation of the effect of masonry infill on the performance of masonry arch bridges *S. Amodio, M. Gilbert, C.C. Smith*
Building structures made of reused cut reinforced concrete slabs and walls: a case study *N. Widmer, M. Bastien-Masse, C. Fivet*	Follow-up assessment of a prestressed concrete road bridge based on dynamic bridge behaviour – analysis of structural integrity and evaluation of maintenance condition *T. Reimoser, R. Veit-Egerer, A. Schmitt, Y. Benitz*	Structural health monitoring of bridges based on GNSS *S. Bianchi, L. Capacci, M. Anghileri, F. Biondini, G. Rosati, G. Cazzulani, S. Barindelli, S. Caldera*	Homogenized mesoscale discrete model for coupled multi-physical analysis of concrete *J. Eliáš, G. Cusatis*	Multi-fidelity modelling of masonry arch bridges under traffic loading *S. Grosman, Q. Fang, L. Macorini, B. A. Izzuddin*
Reuse of fibrous tectonics as the secondary structure of the facade system *A. Ahmadnia, C. Monticelli, S. Viscuso, A. Zanelli*	Laboratory validation of an arduino based accelerometer designed for SHM applications *S. Komarizadehasl, E. Delgado, G. Ramos, J. Turmo*	Remote monitoring of a concrete bridge through InSAR and GNSS measurements *O. Lasri, P.F. Giordano, M. Previtali, M.P. Limongelli*	Early-age cracking in concrete slabs with FRP reinforcement *J.E. Bolander, H. Roghani, A. Nanni*	Analysis of masonry arch bridges using multi-scale discontinuity layout optimization *L. He, N. Grillanda, J. Valentino, M. Gilbert, C. Smith*
Properties and durability of recycled concrete with mixed granulates: application for infrastructures *C. Paglia, C. Mosca, E. Giner Cordero*	Optimal design of a vibration-based sensor network for bridge monitoring *M.F. Yilmaz, K. Ozakgul, B.O. Caglayan*	How to prioritize bridge maintenance using a functional priority index *M. Arena, G. Azzone, V. M. Urbano, P. Secchi, A. Torti, S. Vantini*	Toward distinguishing the chemical, physical, and wetting-drying sulfate attack on concrete *I. A.N.Omrani, M. Koniorczyk, D. Bednarska*	The role of history in the structural assessment of a multi-span masonry arch bridge *G. Zani, P. Martinelli, G. Cardani, M. di Prisco*
Behavior of bolted shear connectors for demountable and reusable UHPC-formed composite beams *H. Fang*	Embedded fibre optical strain monitoring of a bio-composite bridge *M. Weil, Y. Bel-Hadj, W. Weijtjens, C. Devriendt, Y.-A. Janssens, E. Voet*		Research on calculation method of creep and shrinkage effects of steel-concrete-Ultra-High-Performance Concrete (UHPC) composite bridge considering construction process *X.G. Ma, D.W. Zhang, H.W. Ling, H.J. Shen, S.S. Guo, C. Liu*	Stochastic load-carrying capacity assessment of brick masonry arch bridges *B. Liu, I.B. Muhit, V. Sarhosis*
	Rapid assessment of civil structures after disruptive events: Leveraging virtual reality and robotics *F. Luleci, F. N. Catbas*		Modeling of hygro-mechanical coupling effects for shrinkage and creep of concrete *A. Brugger, P. Gamnitzer, G. Hofstetter*	New UK guidance for the assessment of masonry arch bridges *M. Gilbert, C. Smith, S. Amodio*

Concurrent Technical Sessions | MoE-6 to MoE-10 — 17:00 - 18:30 | Monday Evening, July 3rd, 2023

MoE-6 T.2.3 Room	MoE-7 B.0.1 Room	MoE-8 B.1.1 Room	MoE-9 B.2.1 Room	MoE-10 B.3.1 Room
Special Session:	Mini-Symposium:	Mini-Symposium:	Special Session:	Special Session:
Artificial intelligence-based life-cycle management of infrastructure systems	**Non-deterministic model updating for structural health monitoring of existing structures**	**Life-cycle performance assessment of civil engineering systems**	**Structural resilience in bridge engineering: method, theory, and practice**	**Sustainability of steel production chain**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
Y. Dong	M. Broggi	M. Akiyama	S.M.C. Diniz	H. Gervasio
D.M. Frangopol	T. Kitahara	H. Matsuzaki	K. E. Bektas	M.M. Sesana
Sustainability-informed intelligent management of aging civil infrastructure systems with emphasis on bridge networks *X. Lei, Y. Dong, D. M. Frangopol*	Distribution-free stochastic model updating with staircase density functions *M. Kitahara, T. Kitahara, S. Bi, M. Broggi, M. Beer*	Multivariate inspection of German steel civil infrastructure using autonomous UAS *D. Thomas, M. Gündel, A. Wickers, M. Alpen, J. Horn*	A study on the mutual effect on fatigue damage of orthotropic steel decks and pavements *B. Wang, D. Wang, R. Ma, A. Chen*	Net-zero and Lightweight Steel technologies for the construction sector: overview and case studies in Italy *M.M. Sesana*
Meta-learning method for efficient time-variant reliability analysis of deteriorating structures *T. Gao, J. Cheng, Y. Liu, M. Cheng, D. M. Frangopol*	Scenario-oriented analysis of bridges subjected to non-deterministic combined seismic actions based on finite element modeling *S. Yamamoto, G. Shoji, M. Ohsumi*	A life-cycle analysis approach to the impact of green roofs on the structural and thermal performances of buildings *S. Kalantari, M. R. Rashedi, R. Ehsani, F. M. Tehrani*	Modeling of coarse aggregate based on 3D point cloud and spherical harmonics *J.J. Zhang, Z.C. Pan*	Life-cycle assessment of light steel frame buildings: a systematic literature review *G. Marrone, M. Imperadori, M. M. Sesana*
Optimization of sewer flushing programs: a deep reinforcement learning approach *A. Keshvari Fard, X.-X. Yuan*	Probabilistic-based model updating on a prestressed concrete box girder *X. Zhou, D. Chen, C.W. Kim*	Deep learning-based life-cycle system reliability assessment of asphalt pavement *J. Xin, D. M. Frangopol, M. Akiyama*	Bridge Tower aesthetic assessment using Convolutional Neural Network *D.L. Wang, Y. Ning, C. Xiang, A.R. Chen*	Building life-cycle assessment considering different structural materials *J. H. Matias de Paula Filho, M. Charlier, M. D'Antimo*
Carbon emission reduction in railway maintenance using reinforcement learning *J. Sresakoolchai, S. Kaewunruen*	Environmental influence on structural health monitoring systems *J.-H. Bartels, M. Kitahara, S. Marx, M. Beer*	Climate change impact on the Integrity of structures and infrastructure in mountainous or hilly areas *Y. Tsompanakis, N. Makrakis, P.N. Psarropoulos, D.M. Frangopol*	Influence of different curing condition on seismic performance of reinforced concrete bridge piers *W.-Q. Peng, W.-L. Lu, F.-L. Li, Y.-D. Tang, L.-F. Xu*	Optimised steel structures for a low carbon future *M. D'Antimo*
Integrating unstructured data analytics and BIM to support predictive maintenance *S. Sobhkhiz, T. El-Diraby*	Risk-based resilience assessment framework for thermal power plants after a catastrophic seismic event *A. Yuyama, G. Shoji, Y. Kajitani*	Assessing life-cycle seismic fragility of corroding reinforced concrete bridges through dynamic Bayesian networks *F. Molaioni, Z. Rinaldi, C.P. Andriotis*	Travel time gains VS time constancy - an irresolvable contradiction? *M. Hoffmann*	The contribution of low carbon steel to the decarbonization of the building sector *H. Gervasio, L. Simões da Silva, M. D'Antimo*
	Non-deterministic seismic damage detection of road infrastructure analysing image training database *R. Kondo, G. Shoji*	A microservice for evaluating resilience of water distribution network *X.Y. Yu, Y.N. Xu, F. Liu, X.N. Zhou*	End-of-life rule checking for transport infrastructure: The case of navigation locks *K.E. Bektas, I.E. Ozer*	

PROGRAM SCHEDULE

TUESDAY, July 4th, 2023

08.30 – 10.00	Keynote Lectures | Aula Magna
	Jens Sandager Jensen | Digital transition in asset management of bridges – Advantages and challenges **Mark Stewart** | Risk and decision-making for extreme events: What terrorism and climate change have in common **Maddalena Carsana** | Field and laboratory tests for corrosion assessment of existing concrete bridges
10:00 - 10:30	Coffee Break
10:30 - 12:30	Concurrent Technical Sessions | TuM-1 to TuM-10
	TuM-1 | T.0.1 Room | Concrete degradation and modeling TuM-2 | T.0.2 Room | BIM and DT applications TuM-3 | T.1.1 Room | Advances in life-cycle earthquake engineering TuM-4 | T.1.2 Room | Smart maintenance and AI applications TuM-5 | T.1.3 Room | Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions TuM-6 | T.2.3 Room | Life-cycle asset management and the complexity of socio-environmental-technical transitions TuM-7 | B.0.1 Room | Durability performance of materials TuM-8 | B.1.1 Room | Life-cycle cost analysis TuM-9 | B.2.1 Room | Dynamic response, system identification and structural control TuM-10 | B.3.1 Room | Resilience and sustainability of steel based hybrid building structures in the life-cycle environment
12:30 - 14:00	Lunch Break
14:00 - 15:30	Concurrent Technical Sessions | TuA-1 to TuA-10
	TuA-1 | T.0.1 Room | Bridge weigh-in-motion systems and applications to structural health monitoring TuA-2 | T.0.2 Room | Durability and structural assessment of fiber reinforced strengthening materials and strengthened structures TuA-3 | T.1.1 Room | Life-cycle redundancy, robustness, and resilience indicators for aging structures and infrastructure systems under multiple hazards TuA-4 | T.1.2 Room | Smart maintenance and AI applications TuA-5 | T.1.3 Room | The process of decarbonization: from ideation to specification TuA-6 | T.2.3 Room | Life-cycle and sustainability of precast concrete structures TuA-7 | B.0.1 Room | Durability of sustainable reinforced concrete for civil engineering structures TuA-8 | B.1.1 Room | Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions TuA-9 | B.2.1 Room | Corrosion-induced structural damage and prevention measures for reinforced concrete infrastructure TuA-10 | B.3.1 Room | Shaping development planning processes for infrastructure systems under future uncertainty
15:30 - 16:00	Coffee Break
16:00 - 17:30	Concurrent Technical Sessions | TuE-1 to TuE-9
	TuE-1 | T.0.1 Room | Life-cycle and sustainability performance of fastenings TuE-2 | T.0.2 Room | Advanced strengthening and retrofitting solutions for existing concrete structures TuE-3 | T.1.1 Room | Practical applications and value of advanced computational and probabilistic modelling in life-cycle engineering TuE-4 | T.1.2 Room | BIM-based sustainability considerations in infrastructure construction TuE-5 | T.1.3 Room | Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions TuE-6 | T.2.3 Room | Risk-informed life-cycle management of bridges TuE-7 | B.0.1 Room | Reinforced concrete-to-concrete interfaces: experiments and modelling TuE-8 | B.1.1 Room | Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions TuE-9 | B.2.1 Room | Durability of reinforced concrete structures and infrastructures under changing climate conditions

KEYNOTE LECTURES

08:30 - 10:00 | Keynote Lectures | Aula Magna
Chairs: Michel Ghosn, Hitoshi Furuta

Digital transition in asset management of bridges – Advantages and challenges
Jens Sandager Jensen
COWI A/S
Kongens Lyngby, Denmark

Risk and decision-making for extreme events: What terrorism and climate change have in common
Mark Stewart
University of Technology Sydney
Sydney, NSW, Australia

Field and laboratory tests for corrosion assessment of existing concrete bridges
Maddalena Carsana
Politecnico di Milano
Milan, Italy

Concurrent Technical Sessions | TuM-1 to TuM-5				10:30 - 12:30 | Tuesday Morning, July 4th, 2023
TuM-1 T.0.1 Room	**TuM-2 T.0.2 Room**	**TuM-3 T.1.1 Room**	**TuM-4 T.1.2 Room**	**TuM-5 T.1.3 Room**
General Session:	General Session:	Mini-Symposium:	Mini-Symposium:	Mini-Symposium:
Concrete degradation and modeling	**BIM and DT applications**	**Advances in life-cycle earthquake engineering**	**Smart maintenance and AI applications**	**Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
F. Bolzoni	J. Bakker	M. Akiyama	H. Furuta	F. Cannizzaro
C. Andrade	B. Faggiano	L. Capacci	N. Catbas	F. Scozzese
Modelling the thermal response of firestop sealant exposed to standard fire *Z. Ye, A.K. Abu, C.M. Fleischmann, R.P. Dhakal*	Interactive visualization of uncertain embodied GHG emissions for design decision support in early stages using open BIM *K. Forth, A. Borrmann, A. Hollberg*	Review of advances in life-cycle seismic risk and resilience of bridges and bridge networks *L. Capacci, F. Biondini, D. M. Frangopol*	Bolt axial force detection using Deep learning based on vision methods *Y. Chen, J. Lai, G. Hayashi, T. Yamaguchi*	Preliminary investigation on the response sensitivity of masonry arch bridges subjected to scour *F. Scozzese, A. Dall'Asta, E. Tubaldi*
Revisiting shape/size effect formulation of EUROCODE 2 for structural concrete members *S. Abdo, R. Wan-Wendner, R. Caspeele, S.C. Seetharam, Q.T. Phung*	LCA and EPD need digitalization *U.R. Pannuti*	Agile analysis of life-cycle damage cost of concrete frame structures under earthquake *J.M. Bairán, M. García*	Proposal of deep learning ensemble method for phased array ultrasonic testing for tube-to-tubesheet weld of heat exchange *H. Hattori, J. Murakami, N. Shinmura, K. Shinoda, M. Abe, T. Katayama , R. Ioka, T. Wada*	A methodology to derive scour fragility functions for masonry arch bridges *G. Degan Di Dieco, M. Pregnolato, A.R. Barbosa*
Life-cycle assessment of crack repair systems for fire-damaged concrete *R.M. Galano, R.S. Chan, J.M. Ongpeng*	Application of BIM in design review processes for buildings *M. Achenbach, P. Rivas, B. Weber*	Methodology for determining optimal countermeasure for bridges under seismic and tsunami hazards *H. Ishibashi, M. Akiyama, S. Koshimura*	Innovative methods for the inspection of hydraulic structures *A. Seiffert, J. Bödefeld*	Experimental modal analysis and finite element model updating of a historical masonry arch bridge *M. Morici, V. Nicoletti, G. Leoni, F. Gara*
Modeling and characterization strategy as a basis for improved prediction of concrete fatigue degradation in wind power plants *A. Baktheer, M. Aguilar, H. Becks, M. Classen, J. Hegger, R. Chudob*	Development of a method for resource-efficient structural maintenance of reinforced concrete buildings based on digital BIM models *J.-I. Jäkel, L. Kloesgen, T. Koenig, K. Klemt-Albert, H. Morgenstern, M. Raupach*	Seismic damage control of bridges with deteriorated seismic isolation bearings by rupture of anchor bolts *H. Matsuzaki*	Behaviour of corroded bridge bearing and full-bridge modeling *A. Hiraoka, G. Hayashi, T. Yamaguch*	Influence of site effects on the seismic vulnerability of masonry arch bridges *Ö. Saygılı, J. V. Lemos*
Sustainability concept of design of concrete bridges based on LCA *B. Vlasatá, J. Pešta, C. Fiala, P. Hájek, M. Novotná*	Project management and life-cycle cost evaluation using Infrastructure-Building Information Modeling techniques: a railway infrastructure design case study *M. Pasetto, G. Giacomello*	Probabilistic resilience assessment of aging bridge networks based on damage disaggregation and stationary proposal importance sampling *L. Capacci, F. Biondini, A.S. Kiremidjian*	Damage identification of corroded arch bridge using vibration characteristics and rotational angle *K. Akahoshi, G. Hayashi, Y. Chen, T. Yamaguchi*	Computational strategy for the design of monitoring for masonry arch bridges using DIC procedures *S. Grosman, Q. Fang, L. Macorini, B. A. Izzuddin*
Continued	*Continued*	*Continued*	*Continued*	*Continued*

Concurrent Technical Sessions | TuM-1 to TuM-5				10:30 - 12:30 | Tuesday Morning, July 4th, 2023
TuM-1 T.0.1 Room	**TuM-2 T.0.2 Room**	**TuM-3 T.1.1 Room**	**TuM-4 T.1.2 Room**	**TuM-5 T.1.3 Room**
General Session:	General Session:	Mini-Symposium:	Mini-Symposium:	Mini-Symposium:
Concrete degradation and modeling	**BIM and DT applications**	**Advances in life-cycle earthquake engineering**	**Smart maintenance and AI applications**	**Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
F. Bolzoni	J. Bakker	M. Akiyama	H. Furuta	F. Cannizzaro
C. Andrade	B. Faggiano	L. Capacci	N. Catbas	F. Scozzese
Continued	*Continued*	*Continued*	*Continued*	*Continued*
Cost-optimization based generalized target reliabilities for reinforced concrete slab exposed to fire *F. Put, R. K. Chaudhary, A. Lucherini, B. Merci, R. Van Coile*	Digital twins and sensor monitoring for alpine engineering structures: Applications to tunnels *A. Strauss, A. Beigel, F. Sattler, B. Täubling-Fruleux, C. Seywald, H. Neuner, V. Kostjak, D. M. Frangopol*	Dynamic characteristic of geodesic domes with different location of mass *D. Bysiec, T. Maleska, A. Janda*	Identification of spalling in concrete structures by a hammering test using autoencoder *H. Emoto, N. Fukui, Y. Iitaka, S. Kanazawa*	Influence of uncertain mechanical parameters on the load-bearing capacity of multi-span masonry arch bridges *M. Zizi, C. Chisari, G. De Matteis*
Structural behavior of UHPC transition segment of wind tower without ordinary reinforcement under serviceability limit state *L.R. Lin, X. Zhang, X. G. Wu, X. Wang, X.S. Zhang, H. Wang*	Refined perception and management of ring-wise deformation information for shield tunnels based on point cloud deep learning and BIM *W. Lin, X. Xie, B. Zhou, P. Li, C. Wang*	Life-cycle benefits of seismic protection using a novel active mass damper *C. Fontana, M. Caruso, R. Pinho, F. Menardo, G. Rebecchi, A. Bussini*	Corrosion progress detection in steel bridge from vehicle-mounted camara Images based on deep learning *S. Ozaki, Y. Nomura, H. Furuta, H. Yamazaki, Y. Yamato*	Simplified analysis on multiring masonry arch bridges *R. Piazzon, P. Zampieri, C. Pellegrino*
A phase-field-based chemo-mechanical model for corrosion-induced cracking in reinforced concrete *E. Korec, M. Jirásek, H.S. Wong, E. Martínez-Pañeda*	Digital Twin - solution in the digital age for improving critical infrastructure resilience to extreme events *M.Q. Tran, H.S. Sousa, E. Texeira, J.C. Matos, H.T. Dang*	Decision-making procedures for optimal seismic-energy integrated retrofitting of buildings *M. Caruso, R. Pinho, R. Monteiro, R. Couto*	Development of a cable inspection robot for cable-stayed bridges *K. Kawamura, W. Zheng, M. Shiozaki*	Effects of changing temperature in the vibration-based model updating of a masonry bridge *P. Borlenghi, A. Saisi, C. Gentile*

Concurrent Technical Sessions | TuM-6 toTuM-10				10:30 - 12:30 | Tuesday Morning, July 4th, 2023
TuM-6 T.2.3 Room	**TuM-7 B.0.1 Room**	**TuM-8 B.1.1 Room**	**TuM-9 B.2.1 Room**	**TuM-10 B.3.1 Room**
Mini-Symposium:	General Session:	General Session:	General Session:	Mini-Symposium:
Life-cycle asset management and the complexity of socio-environmental-technical transitions	**Durability performance of materials**	**Life-cycle cost analysis**	**Dynamic response, system identification and structural control**	**Resilience and sustainability of steel based hybrid building structures in the life-cycle environment**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
A. Hartmann	L. Ferrara	J.R. Casas	L. Martinelli	D. Dubina
J. Bakker	K. Maekawa	F. Tizzani	M. Noori	F. Dinu
Multi-stakeholder service life design for rail level crossings *Y. Shang, R. Binnekamp, A.R.M. Wolfert*	The impact of surface aspect ratio on the embodied energy, embodied carbon, and embodied water of a building structure *M.K. Dixit, P. Pradeep Kumar*	Rehabilitation of underground garages – defining a cost function for use in the decision-making process *J.M. Lozano Valcarcel, C. Gehlen, T. Kraenkel, A. Schiessl-Pecka, J.D. Cassiani, S. Kessler*	Evaluation of low-velocity impact damage in metal/composite layered structure *S. TerMaath, B. Ingling*	Life-cycle assessment of cold formed steel buildings: main influential materials and parameters *O. Iuorio, A. Gigante*
Preference-based service life design of floating wind structures *H.J. van Heukelum, A.C. Steenbrink, O. Colomés, R. Binnekamp, A.R.M. Wolfert*	Numerical evaluation on electrical resistivity of hardened cement paste using 3D pore model based on X-ray micro-CT images *K. Kawaai, T. Nishida*	Life-cycle cost analysis of possible solutions for converting existing single-family house into nZEB *C. Marincu, D. Dan*	Numerical verification of vehicle-bridge interaction system identification using a 3D models *E. Mudahemuka, S. Ryota, K. Yamamoto*	The new construction products regulation: opportunity or barrier for reused constructional steel? *P. Hradil, L. Fülöp, M. Wahlström, C. del Castillo*
A life-cycle assessment framework for pavement management considering uncertainties *A. Vargas-Farias, J. Santos, A. Hartmann, F. Van der Pijl*	Coupled deterioration by freeze-thaw and chloride salt on mill-cut steel fiber reinforced concrete *S. Liu, Y. Liu, Y. Li, L. Fan, Z. Yang*	Environmental and economic assessment of service life extending repairs for a concrete silo *N. Renne, A. Audenaert, M. Buyle, B. Craeye*	Parametric study of the vehicle-bridge interaction system identification method *R. Shin, Y. Okada, K. Yamamoto*	A comparative life-cycle assessment of structural composite steel-concrete floor systems – A case study *I. Lukačević, A. Rajić, V. Ungureanu, R. Buzatu*
To replace or not to replace: a model for future functional performance of bridges *S.C.A. Mooren, A. Hartmann, S. Asgarpour*	Preliminary assessment on the effects of longitudinal cracks on carbonation-induced corrosion *N. Russo, M. Gastaldi, F. Lollini, L. Schiavi, A. Strini*	Bayesian pre-estimation of bridge life-cycle costs *T. Vagdatli, K. Petroutsatou, P. Panetsos, Z. Barmpa, N. Fragkakis*	Dissipative steel and steel-concrete composite beam-to-column joints *G. Skarmoutsos, U. Kuhlmann*	Sustainability and seismic resilience of hybrid lightweight residential buildings *D. Dubina, V. Ungureanu, M. Mutiu*
The end-of-life of bridges: integrating functional, technical and economic perspective *A. Hartmann, J. Bakker*	How to better exploit the use of LCA analysis for Ultra High Performance Concrete (UHPC) through a constitutive law which integrates chloride and sulfate attack *D. di Summa, F. Soave, M. Davolio, S. Al-Obaidi, L. Ferrara, N. De Belie*	Reliable estimation of investment and life-cycle costs from road projects to single road assets *M. Hoffmann, V. Donev*	Service-life extension of transport infrastructure through Structural Health Monitoring *M. Domaneschi, R. Cucuzza, L. Martinelli, M. Noori*	Influence of fastening systems on the ultimate capacity of steel- faced sandwich wall panels under transverse loads *F. Dinu, C. Neagu, S. Lindiri, M. Senila*
Continued	*Continued*	*Continued*	*Continued*	*Continued*

Concurrent Technical Sessions | TuM-6 to TuM-10				10:30 - 12:30 | Tuesday Morning, July 4th, 2023
TuM-6 T.2.3 Room	**TuM-7 B.0.1 Room**	**TuM-8 B.1.1 Room**	**TuM-9 B.2.1 Room**	**TuM-10 B.3.1 Room**
Mini-Symposium:	General Session:	General Session:	General Session:	Mini-Symposium:
Life-cycle asset management and the complexity of socio-environmental-technical transitions	**Durability performance of materials**	**Life-cycle cost analysis**	**Dynamic response, system identification and structural control**	**Resilience and sustainability of steel based hybrid building structures in the life-cycle environment**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
A. Hartmann	L. Ferrara	J.R. Casas	L. Martinelli	D. Dubina
J. Bakker	K. Maekawa	F. Tizzani	M. Noori	F. Dinu
Continued	*Continued*	*Continued*	*Continued*	*Continued*
How to estimate costs of replacement for an aging infrastructure, a Dutch case study *G.A. de Raat*	Quantification of the effect of corrosion on the compressive membrane action in restrained hollow core slabs *T. Thienpont, W. De Corte, R. Van Coile, R. Caspeele*	Developing a cost-control and project-planning based implementation of circular construction in temporary works: A framework of core supportive technologies *F. Tizzani, P. Herthogs, R. Stouffs*	Service-life extension of transport infrastructure through Structural Control *L. Martinelli, M. Domaneschi, R. Cucuzza, M. Noori*	Simplified assessment of the cyclic performance of steel constructions in aggressive environments *A. Milone, R. Landolfo*
Plannability of maintenance in life-cycle decision making for infrastructure *J.D. Bakker, R. Treiture*	Life-cycle of existing asphalt to build new highway foundation pavements: environmental procedures according to new Italian standards, geotechnical and durability performance assessments, construction methods. *M. Biasioli, F. T. Isfahani, D. Giometti, C. Beltrami, G. Piovano, F. Vergano, M. Marino*	Development of life-cycle inventory for timber products to support the circular economy in construction *S. Ge, P.J. McGetrick, C. O'Ceallaigh, A.M. Harte*	Seismic base isolation of Palazzo Partigiani in Perugia *F. Parisi, T. Zordan, A. Romano*	Multi-hazard robustness assessment of seismic resistant multi-story steel frame buildings *D. Dubina, F. Dinu, J. Dominiq*
Predictive twin for steel bridge in the Netherlands *G.A. de Raat, J.D. Bakker, G.T. Luiten, J.H. Paulissen, B.Q. de Vogel, H. Scholten, S. de Graaf*	Numerical analysis of prestressed sleepers affected by expansive mechanisms *R.P. Randi, L.M. Trautwein, D.J.M. Mariata, L.F.M. Sanchez, A.C. Santos*	Life-cycle cost of CFRP and steel prestressed concrete elements *J.M. Bairán, J. Murcia-Delso, N. Duarte, E. Oller, A. Marí*		Laser scanning technology for the evaluation of damage in complex building envelopes after extreme load events *P.C. Zdrenghea, F. Dinu, S. Herban, C. Neagu*
				Design strategies for reusable structural components in the built environment *F. Kavoura, M.Veljkovic*

Concurrent Technical Sessions | TuA-1 to TuA-5 — 14:00 - 15:30 | Tuesday Afternoon, July 4th, 2023

TuA-1 T.0.1 Room	TuA-2 T.0.2 Room	TuA-3 T.1.1 Room	TuA-4 T.1.2 Room	TuA-5 T.1.3 Room
Special Session:	Special Session:	Special Session:	Mini-Symposium:	Special Session:
Bridge weigh-in-motion systems and applications to structural health monitoring	**Durability and structural assessment of fiber reinforced strengthening materials and strengthened structures**	**Life-cycle redundancy, robustness, and resilience indicators for aging structures and infrastructure systems under multiple hazards**	**Smart maintenance and AI applications**	**The process of decarbonization: from ideation to specification**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
S. Mustafa	M.A. Aiello	F. Biondini	N. Catbas	D. Shook
D. Cantero	M. Leone	D.M. Frangopol	Y. Nomura	M. Sarkisian
Bridge weigh-in-motion to support SHM *D. Cantero*	Freeze/thaw effects on the performances of FRCM strengthened reinforced concrete beams *S. Verre, M. Guglielmi*	Financial risk assessment of flexible infrastructure systems *N. Acuña-Coll, M. Sánchez-Silva*	Application of cluster analysis and Markov chain model for network-level highway infrastructure management *A. Amir, M. Henry*	Resilience through superelasticity *D. Shook, M. Sarkisian, C. Horiuchi*
Bayesian-based bridge influence line identification and uncertainty estimation *S. Mustafa, I. Yoshida, H. Sekiya*	Interface experimental behavior between Basalt-FRCMs and natural stones *G. Bramato, M. Leone, M.A. Aiello*	Time-dependent assessment of corrosion impact on R/C members *M. Calò, G. Gabbianelli*	Digital twin-oriented maintenance: A hybrid finite element and surrogate model approach for predicting the excavation-induced tunnel displacement *Y. Gu, L. Zhang, Q. Ai, X. Jiang, Y. Yuan*	Design of the urban sequoia tower *M. Sarkisian, E. Long, A. Beghini, K. Micallef, S. Jaberansari*
Bridge weigh-in-motion: feedback on various types of bridges *F.B. Cartiaux, V. Le Corvec, J. Semiao, A. Brouste*	Tensile behavior of a glass FRCM composite with textile lap splice exposed to freeze-thaw cycles *A.S. Calabrese, V. Bertolli, P. Colombi, T. D'Antino, C. Poggi*	Resilience-based optimal management of aging bridge networks under main-shock-aftershock sequences *L. Jafari, L. Capacci, F. Biondini, M. Khanmohammadi*	Development of simple fatigue crack propagation monitoring using IoT *T. Ishikawa, N. Matsumoto, K. Komon*	Achieving net zero embodied carbon: The SE2050 program and its impact on structural design *C. Horiuchi, N. Wang, M. Stringer*
Estimation of remaining fatigue life of railway bridges using measurements from the WIM system *M. Zakharenko, G.T. Frøseth, A. Rönnquist*	Effect of salt crystallization on the bond behavior of glass FRCM-masonry joints *V. Bertolli, A. Cagnoni, A. S. Calabrese, P. Colombi, T. D'Antino*	Risk-based optimal life-cycle maintenance of post-tensioned concrete bridges considering accuracy of inspection methods in structural model updating *M. Taeby, A.B. Mehrabi, K. Lau*	Detection of debonding of CFRP bonded steel members using the AE method *M. Mizutani, T. Ishikawa, Y. Fujii*	Quantifying and specifying decarbonization in buildings *N. Wang, D. Shook, K. Chang, E. Leung*
Bridge-weigh-in-motion by strain of transverse stiffener and heavy-truck traffic characteristics in Fukuoka area, Japan *E. Yamaguchi, Y. Furusato, R. Nakamura, K. Horiuch*	On the behaviour of FRCM fibres in saturated alkaline solution *M. Canestri, F. Ferretti, E. Sassoni, C. Mazzotti*	Redundancy, importance, and robustness analyses for damage scenarios of bridges *S. Sarmiento, J. González-Libreros, G. Sas, I. Björnsson, S. Thöns*	Condition-based maintenance of fatigue-sensitive structures using model predictive control *S. Kong, R. Cao, J. Cheng, Y. Liu*	Carbon optimization of hybrid material structures *M. Sarkisian, D. Shook, A. Zha, C. Horiuchi*
Deep sensor-fusion approach to vehicle detection on bridges using multiple strain sensors *H.T. Vuong, A. Takasu, T.P. Doan*	Durability of CRM reinforcements *F. Micelli, A. Franco, R. Greppi, M.A. Aiello*	Progressive collapse behavior of RC frames subjected to reinforcement corrosion *L.C. Ding, Y.B. Peng. J.B. Chen*	A deep learning-based corrosion prediction model for paint-coated steel with defects *F. Jiang, M. Hirohata*	Life-cycle and sustainability impact of composite and combined concrete tunnel linings *P. Spyridis, K. Bergmeister*

Concurrent Technical Sessions | TuA-6 to TuA-10			14:00 - 15:30 | Tuesday Afternoon, July 4th, 2023	
TuA-6 T.2.3 Room	**TuA-7 B.0.1 Room**	**TuA-8 B.1.1 Room**	**TuA-9 B.2.1 Room**	**TuA-10 B.3.1 Room**
Special Session:	Special Session:	Mini-Symposium:	Special Session:	Special Session:
Life-cycle and sustainability of precast concrete structures	**Durability of sustainable reinforced concrete for civil engineering structures**	**Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions**	**Corrosion-induced structural damage and prevention measures for reinforced concrete infrastructure**	**Shaping development planning processes for infrastructure systems under future uncertainty**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
B. Dal Lago	M. Carsana	A. Pavese	S. Yang	A. Elvarsson
F. Cavalieri	E. Redaelli	M. Furinghetti	W. Zhang	O. Román
Seismic response analysis of precast structures retrofitted with dissipation devices, including qualitative assessment of environmental impact *F. Cavalieri, D. Bellotti, M. Caruso, R. Nascimbene*	Performance and environmental analysis of Reclaimed Asphalt Pavement (RAP) concrete produced in industrial environment *G. Masi, A. Michelacci, S. Manzi, A. degli Esposti, B. De Pascale, A. Bonoli, M.C. Bignozzi*	Prestressed Lead Damper for seismic protection of structures *V. Quaglini, C. Pettorruso, E. Bruschi, M. Sartori*	Corrosion and bond behavior of silicate dioxide particle modified enamel coated steel bar *F. Tang, Y. Kuang, H. Cui, Z. Lin*	The value of accelerating the infrastructure planning process *A. B. Elvarsson, B. T. Adey, O. Roman*
Aggregates for innovative use in precast concrete panels: State of the Art and perspectives *M. L. Puppio, F. Coccu, A. Usman, M. Valdés, A. Frattolillo, M. Sassu, L. Casali*	Life extension of existing steel reinforced structures by simple cathodic protection techniques for sustainable durability *G. Sergi*	Nonlinear analysis of base isolated buildings with curved surface sliders including over-stroke displacements *F. C. Ponzo, A. Di Cesare, N. Lamarucciola*	Non-destructive investigation of corrosion in reinforced concrete structures and modelling the structural degradation *S.T. Yang, F. Zhang, Z. Yin, X. Xi*	Stakeholder inclusive port development planning for an uncertain future *M. Eskafi, G. F. Ulfarsson*
Environmental impact reduction of precast multi-storey buildings by crescent-moon seismic dampers hidden in beam-column joints *L. Casali, B. Dal Lago, A. Fulco, M. Mezzi*	Corrosion of rebars in concrete: comparison of preventative measures *F. Bolzoni, A. Brenna, S. Beretta, M. Ormellese, M.V. Diamanti, M.P. Pedeferri*	Effects of wear on the friction coefficient of a Curved Surface Slider *V. Quaglini, E. Bruschi, E. Çavdar, G. Özdemir, V. Karuk, U. Özçamur*	Chloride transport properties of Portland cement and limestone systems *Z.L. Jiang, Z. Dong, C.Q. Fu, Y.J. Pan, Y.C. Wang*	Probabilistic circular economy assessment for infrastructures considering time-variant influencing factors *H. Lei, W. Wang, C.Q. Li, W. Yang*
Life-cycle assessment of coal mining wastes upcycling *S. Muller, F. Lai, M. Nucci, E.Segù, R. Crane, W. Nash, A. Wrana, B. Bezak, L. Ferrara*	Role of concrete and reinforcement characteristics to increase the service life of structures *M.C. Alonso*	Effects of rubber shear modulus variability on the seismic response of isolated bridges *M. Marra, S. Silvestri*	Simplified analytical method for moment-curvature response of corroded prestressed concrete beams *S. Ravasini, L. Franceschini, B. Belletti*	Data-driven infrastructure systems design for uncertainty, sustainability, and resilience *M.-A. Cardin, A. Mijic, J. Whyte*
The potential for direct reuse of precast concrete slabs in buildings with "wet" joints *P.S. Halding, K. Negendahl*	Durability performance indicators for service life analysis and quality control *F. Moro, R.J. Torrent*	Prediction of the response of a lead-core rubber bearing using machine learning *T. Zhelyazov, S. Ólafsson, R. Rupakhety*	Structural behavior of PC beams under simultaneous corrosion and sustained loads *F.F. Bico, M. Bartoli, F. Di Carlo, A. Meda, F. Molaioni, Z. Rinaldi*	Evaluating design modifications on a building portfolio considering future uncertainty and multiple stakeholders *C. Martani, N. Calen, B. T. Adey*
Development of high durable precast PC deck with ultra-high-strength fiber-reinforced concrete layer *H. Hayashi, Y. Yasukawa, N. Oba, K. Sasaki*	Chloride ingress of concrete structure considering the effect of early-age shrinkage *Y. Li, X. Ruan, T. Li, W.Y. Dou*	Experimental assessment of anti-seismic devices performance *A. Pavese, S. Reale, M. J. Fox*	Random field analysis of corrosion of steel in the artificial marine atmosphere *W. Zhang, X. Gu, Q. Yu, J. Chen*	Exploratory modelling for transport infrastructure planning under future uncertainty *O. Roman, A. B. Elvarsson, B. T. Adey*

Concurrent Technical Sessions | TuE-1 to TuE-5				16:00 - 17:30 | Tuesday Evening, July 4th, 2023
TuE-1 T.0.1 Room	**TuE-2 T.0.2 Room**	**TuE-3 T.1.1 Room**	**TuE-4 T.1.2 Room**	**TuE-5 T.1.3 Room**
Special Session:	Mini-Symposium:	Special Session:	Special Session:	Mini-Symposium:
Life-cycle and sustainability performance of fastenings	**Advanced strengthening and retrofitting solutions for existing concrete structures**	**Practical applications and value of advanced computational and probabilistic modelling in life-cycle engineering**	**BIM-based sustainability considerations in infrastructure construction**	**Safety and maintenance of masonry arch bridges: diagnostic, monitoring, modelling, risk analysis and retrofit interventions**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
P. Spyridis	N. Randl	A. Strauss	M. König	M. Zizi
G. Muciaccia	E. Rossi	H. Sousa	M. Müller	P. Zampieri
Installation, structural, and sustainability characteristics of direct fastening in textile reinforced concrete plates *P. Spyridis, J. Orlowsky, K. Bergmeister*	Numerical investigation of the effects of graphene on the mechanical properties of fibre reinforced cementitious matrix composite *X.M. Zhu, M. N. Su, Y.C. Wang*	Semi-probabilistic assessment of concrete bridge exploiting additional data from experiments and numerical analysis *L. Novak, D. Novák, M. Cao, R. Pukl*	Potential of holistic asset information management *A. Buttgereit, M. Block, D. Gogolin, S. Gomolluch*	Numerical approaches to assess the load capacity of FRCM strengthened masonry bridges *D. Santinon, P. Zampieri, C. Pellegrino, D. Ricci, F. Iodice, A. Vecchi, F. Iacobini*
Redundancy of concrete fastenings under combined fatigue and corrosion – a probabilistic study on catenary system installations *S. Kessler, N. Mellios, A. Takriti, P. Spyridis*	Experimental behavior of FRCM-confined concrete under high temperature *F. Faleschini, C. Pellegrino, K. Toska, M. Zanini*	Probabilistic structural assessment of RC bridges under corrosion based on efficient simulation methods *F. Padovani, L. Capacci, F. Biondini*	Towards environmental design decision-making for infrastructure planning using parametric BIM *J. Hofmeyer, K. Forth, S. Esser, A. Borrmann*	3D collapse mechanisms of masonry bridges subjected to horizontal actions *L. Niero, P. Zampieri, C. Pellegrino*
Long term assessment of bonded anchors with two different methods, Findley extrapolation vs. time-to-failure approach *I. Boumakis, K. Nincevic, R. Piccinin, R. Wan-Wendner, T. Pregartner, K. Bergmeister*	Retrofit of RC bridge half-joints: applications and remarks with emphasis on post-tension techniques *G. Santarsiero, V. Picciano, A. Masi, G. Ventura*	Life-cycle assessment of Tunnel Boring Machine (TBM) segments of a new tunnel: Carbonation attack and sulfate attack *F. T. Torabian, I. Vangelisti, C. Beltrami*	BIM-based EPD adaption in the context of ecological sustainability and municipal infrastructures *J. Maibaum, M. Block, M. König, A. Wachsmann*	Near-collapse deformed configuration of masonry arch bridges *G. Stagnitto, P. Zampieri*
Impact of concrete age and aggregate type on anchor load performance *K. Nincevic, R. Piccinin, I. Boumakis, T. Pregartner, R. Wan-Wendner*	Enhancing Textile Reinforced Concrete materials by admixing short dispersed fibres *E. Rossi, N. Randl*	Holistic assessment-framework for railway noise barrier constructions *M.F. Granzner, A. Strauss, M. Reiterer*	Element approach for BIM-based life-cycle modeling of bridges *M. Müller, T. Zinke, T. Ummenhofer*	Safety checking at point and section level of masonry arch bridges *G. Stagnitto, R. Siccardi, M. Ghioni, P. Zampieri*
Impact of End-Of-Life stage in cradle-to-cradle LCA analysis of timber and timber-hybrid buildings *L. Corti, G. Muciaccia*	Shear strengthening with F/TRC: experimental investigation on real scale RC beams *E. Rossi, N. Randl*		Robot-BIM integration for underground canals life-cycle management *H. Pourhosseini, F. Zahedi, J. M. Sardroud*	Discrete Macro-Element structural assessment of a railway masonry arch bridge subjected to pier settlements *D. Rapicavoli, F. Cannizzaro, S. Caddemi, I. Caliò*
	State of the art in flexural prestressing of RC members with SMA materials *J. Rogowski, R. Kotynia*		Legal governance for BIM – rights management and lawful data use *B. Weber, M. Achenbach*	Rehabilitation, strengthening and life-cycle assessment of an historical water channel Cavour masonry bridge crossing Cervo River after an extreme flood erosion at foundation pier causing massive settlement and large structural damages *C. Beltrami, M. Capalbo, G. Giacalone, M. Vittone, G. Comaita, I. Vangelisti, F. T. Isfahani, F. Damiani, R. Salomone, L. Casti, J. Salvioni, D. Cagliani, F. Burlone, M. Fossati, M. F. Carera*

Concurrent Technical Sessions | TuE-6 to TuE-10				16:00 - 17:30 | Tuesday Evening, July 4th, 2023
TuE-6 T.2.3 Room	**TuE-7 B.0.1 Room**	**TuE-8 B.1.1 Room**	**TuE-9 B.2.1 Room**	**TuE-10 B.3.1 Room**
Special Session:	Special Session:	Mini-Symposium:	Special Session:	
Risk-informed life-cycle management of bridges	**Reinforced concrete-to-concrete interfaces: experiments and modelling**	**Recent advance in seismic protection systems: design, modeling and testing strategies of traditional and innovative solutions**	**Durability of reinforced concrete structures and infrastructures under changing climate conditions**	
Chairs:	Chairs:	Chairs:	Chairs:	
M.P. Limongelli	V. Palieraki	M. Furinghetti	F.Landi	
L. Ierimonti	S. Cattaneo	A. Pavese	F. Marsili	
SHM-informed management of bridges in a life-cycle perspective *L. Ierimonti, F. Mariani, I. Venanzi, F. Ubertini*	Effect of size on the shear strength between old to new concrete interface *S. Cattaneo, M. Scamardo*	Vulnerability assessment of bridges within the Italian highway network *S. Reale, A. Pavese, M. Furinghetti*	Exploratory analysis of the impact of natural hazards on road infrastructure in the Philippines *M. Adarne, A. Amir, M. Henry*	
Integration of MCDM-based regional flood hazard indexing with the Cerema guidelines for risk assessment of riverine bridges *M. Loli, G. Kefalas, S. Dafis, S. A. Mitoulis, F. Schmidt*	Experimental behavior of interfaces with anchors to thin overlays *E. Oikonomopoulou, V. Palieraki, E. Vintzileou, G. Genesio*	Life-cycle assessment (LCA) of fiber-reinforced reclaimed-rubber seismic isolators *F. Cilento, D. Losanno, C. Menna, C. Ciriello, F. Parisi*	Prediction of r.c. bridge deterioration under changing environmental conditions *F. Landi, P. Croce, Marsili F., S. Kessler*	
Assessment as to the best strategies for the maintenance of existing bridges *A. Contardi, G. Pasqualato*	Calculation of the interface resistance in RC construction using different codes *V. Palieraki, E. Vintzileou, S. Cattaneo*	Definition of a design procedure of seismic isolation systems based on rubber bearings *M. Furinghetti*	Life-cycle assessment of r.c. bridge components based on cluster analysis and stochastic process *F. Marsili, S. Keßler, F. Landi*	
The possibility of data integration of drive-by monitoring and direct bridge monitoring *M. Miyagi, R. Shin, E. Mudahemuka, K. Yamamoto*	Composite action in tunnel linings by use of shear connectors in concrete interfaces *K. Mitroulis, N. Mellios, P. Spyridis, K. Bergmeister*	Inverse design of isolated structures using predicted FEMA P-58 decision variables *H.G. Pham, T.C. Becker*	Corrosion effects of RC bridges considering the climate change impact *M. Zucca, M. L. Puppio, F. Mistretta, F. Landi, P. Formichi, P. Croce*	
	Performance-based design of new concrete walls for building seismic rehabilitation *S.M. Alcocer, B. Moctezuma*	Seismic behaviour of building using damage-avoidance shearwall hold-downs *L. Budi*		
		Modeling the deterioration of bridges due to earthquakes *L. Iannacone, P. Gardoni*		

PROGRAM SCHEDULE

WEDNESDAY, July 5th, 2023

09.00 – 10.00	Keynote Lectures | Aula Magna
	Ho-Kyung Kim | Life-cycle sea-crossing bridge operation under strong winds in severe weather **Robby Caspeele** | Bayesian assessment of existing concrete structures: Exploiting the full power of combined information
10.00 – 11.00	Keynote Lectures | Aula Magna
	Michel Ghosn | Safety assessment of civil infrastructure assets subjected to extreme events **Francesco Canali** | The structural life of a Cathedral and the worksites of the Duomo di Milano
11:00 - 11:30	Coffee Break
11:30 - 13:00	Concurrent Technical Sessions | WeM-1 to WeM-9
	WeM-1 | T.0.1 Room | Concrete damage assessment using coda waves WeM-2 | T.0.2 Room | Advanced strengthening and retrofitting solutions for existing concrete structures WeM-3 | T.1.1 Room | BRIDGE|50: Experimental testing and model validation for life-cycle design and assessment of RC/PC bridges WeM-4 | T.1.2 Room | Optimization of inspection, monitoring and maintenance strategies for existing concrete structures WeM-5 | T.1.3 Room | SHM for life-cycle informed management of degrading structures WeM-6 | T.2.3 Room | Strengthening and rehabilitation of steel bridges WeM-7 | B.0.1 Room | Exploiting digitalization in the intervention planning for transportation infrastructure WeM-8 | B.1.1 Room | Assessment of infrastructure facilities WeM-9 | B.2.1 Room | Deterioration modeling of concrete, rebar, steel and bond performance
13:00 - 14:30	Lunch Break
14:30 - 16:30	Concurrent Technical Sessions | WeA-1 to WeA-10
	WeA-1 | T.0.1 Room | Use of SHM and NDE for decision making WeA-2 | T.0.2 Room | Deconstruction and reuse of steel and lightweight metal structures WeA-3 | T.1.1 Room | Experimental testing and structural modeling of bridges WeA-4 | T.1.2 Room | Seismic performance assessment WeA-5 | T.1.3 Room | Performance, safety, and cost of civil infrastructure in a life-cycle context WeA-6 | T.2.3 Room | Testing and diagnostics WeA-7 | B.0.1 Room | Safety and durability of high-performance structures WeA-8 | B.1.1 Room | Data management and analysis for predictive maintenance of aging infrastructure WeA-9 | B.2.1 Room | Life-cycle-oriented computational tools WeA-10 | B.3.1 Room | Life-cycle assessment of materials and components
16:30 - 17:00	Closing Ceremony | Aula Magna

KEYNOTE LECTURES

09:00 - 10:00

Keynote Lectures | Aula Magna
Chairs: Mark Stewart, Mitsuyoshi Akyiama

Life-cycle sea-crossing bridge operation under strong winds in severe weather
Ho-Kyung Kim
Seoul National University
Seoul, Korea

Bayesian assessment of existing concrete structures: Exploiting the full power of combined information
Robby Caspeele
Ghent University
Ghent, Belgium

10:00 - 11:00

Keynote Lectures | Aula Magna
Chairs: Eugen Brühwiler, Mark Sarkisian

Safety assessment of civil infrastructure assets subjected to extreme events
Michel Ghosn
The City College of New York / CUNY
New York, NY, USA

The structural life of a Cathedral and the worksites of the Duomo di Milano
Francesco Canali
Veneranda Fabbrica del Duomo di Milano
Milan, Italy

Concurrent Technical Sessions | WeM-1 to WeM-5 — 11:30 - 13:00 | Wednesday Morning, July 5th, 2023

WeM-1 T.0.1 Room	WeM-2 T.0.2 Room	WeM-3 T.1.1 Room	WeM-4 T.1.2 Room	WeM-5 T.1.3 Room
Special Session:	Mini-Symposium:	Special Session:	Special Session:	Special Session:
Concrete damage assessment using coda waves	**Advanced strengthening and retrofitting solutions for existing concrete structures**	**BRIDGE|50: Experimental testing and model validation for life-cycle design and assessment of RC/PC bridges**	**Optimization of inspection, monitoring and maintenance strategies for existing concrete structures**	**SHM for life-cycle informed management of degrading structures**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
C. Gehlen	E. Rossi	F. Biondini	R. Caspeele	M.P. Limongelli
J. Timothy	N. Randl	F. Tondolo	A. Strauss	N. Makhoul
Ultrasonic monitoring of large-scale structures - input to engineering assessment *N. Epple, C. A. Sanchez-Trujillo, E. Niederleithinger*	FRP shear dowels - Experimental investigation *Đ. Čairović, M. Zlámal, J. Venclovský, P. Štěpánek*	Large-scale experimental testing of 50-year-old prestressed concrete bridge girder *P. Savino, A. Quattrone, D. Sabia, B. Chiaia, F. Tondolo, M. Anghileri, F. Biondini, G. Rosati*	Non-destructive and partially destructive test locations in RC structures: A combined spatial optimisation and Bayesian updating approach *S. Karmakar, S. Ghosh, D. Saha, S.A. Faroz*	The role of life-cycle civil engineering practices in smart and sustainable cities *M. D. Lepech, A. S. Kiremidjian, K. H. Law*
A new technique to detect altered stresses in tendons early *N. Sträter, F. Clauß, M.A. Ahrens, P. Mark*	Bond behavior of CFRP-concrete systems using toughened epoxies *D. V. Achillopoulou, A. Kosta, A. Montalbano, F. Choffat*	Experimental tests for mechanical characterization of prestressed concrete bridge deck beams *M. Anghileri, G. Rosati, F. Biondini, P. Savino, F. Tondolo*	FL decision system to choose the best maintenance strategy depending on condition *F. Binder, N. Hlebec, U. Schneck, A. Strauss*	Integration of information quality assessment in bridge resilience management *N. Makhoul, M. P. Limongelli*
Comparison of structural analysis results with coda wave interferometry measurements *S. Grabke, K.-U. Bletzinger*	The effect of fatigue loading on the behavior of externally bonded CFRP-to-concrete joints using the grooving method *M. Khorasani, G. Muciaccia, D. Mostofinejad*	Experimental campaign for corrosion assessment of 50-year-old PC deck beams *M. Carsana, E. Redaelli, D.O. Valoti, F. Biondini*	Probability-based service life design of repair mortar overlay in case of chloride-induced depassivation risk *K. Van Den Hende, S. Helderweirt, W. Botte, S. Matthys, R. Caspeele, G. Lombaert*	Optimum inspection scheduling of steel storage tanks based on past ultrasonic thickness measurements *S.A. Faroz, M.S. Khan, S. Ghosh*
About the separation of impacts on coda waves in concrete *F. Diewald*	Externally applied textile reinforced systems on RC members: innovative and sustainable materials and techniques. *F. Bencardino, R. Curto*	Experimental validation of nonlinear finite element analysis of PC bridge deck beams based on the results of full-scale load tests *M. Anghileri, F. Biondini*	Early detection of corrosion in reinforced concrete using ultrasonic-guided waves *N. Habbaba, S. Mustapha, Y. Lu*	Value of information under random decision, model, and measurement errors *Z.Y. Mir Rangrez, J. Ghosh, S. Ghosh, C. Caprani*
A virtual lab for damage identification in concrete using Coda waves *G. Vu, G. Meschke, J. J. Timothy, E. H. Saenger*	Experimental investigation on strengthening of RC members with HSC overlays *N. Randl, M. Steiner*	Dynamic response of PC bridge beams under different damages *D. Sabia, A. Quattrone. P. Savino, F. Tondolo*	The use of corrosion rates for the identification of damaged zones in a football stadium and efficacy of surface inhibitors as repair method *C. Andrade, J.J Muñoz, J.R. Rosell*	A review on low-cost sensors compatible with open-source platforms used for life-cycle monitoring of civil structures *M. Komary, S. Komarizadehasl, J. Turmo, F. Lozano, J. A. Lozano-Galant, X. Ye*
The hydration of cement paste: thermodynamics driven multi-scale modeling of elastic properties and coda wave interferometry based monitoring *E. Jägle, J. J. Timothy, F. Diewald, T. Kränkel, C. Gehlen, A. Machner*	Innovative shear strengthening with post-installed undercut anchors *N. Randl, P. Harsányi, J. Kunz*		Applications of drone inspection and use of strain-hardening cementitious composites (ECC/SHCC) in lowering carbon footprint and life-cycle cost of bridges *D. K. Mishra, P. Ranjan, H. Sun, J. Yu, P. L. Ng*	On the utilization of multiple information for the integrity management of deteriorating systems *G. Costa, M. P. Limongelli, S. Thöns*

Concurrent Technical Sessions | WeM-6 to WeM-9			11:30 - 13:00 | Wednesday Morning, July 5th, 2023	
WeM-6 T.2.3 Room	**WeM-7 B.0.1 Room**	**WeM-8 B.1.1 Room**	**WeM-9 B.2.1 Room**	**WeM-10 B.3.1 Room**
Special Session:	Special Session:	General Session:	Special Session:	
Strengthening and rehabilitation of steel bridges	**Exploiting digitalization in the intervention planning for transportation infrastructure**	**Assessment of infrastructure facilities**	**Deterioration modeling of concrete, rebar, steel and bond performance**	
Chairs:	Chairs:	Chairs:	Chairs:	
X. Jiang	S. Chuo	J. Matos	X. Gao	
X. Qiang	H. Mehranfar	H. Roebers	J. Li	
Numerical analysis of weld throat crack of rib-to-deck reinforced by bonding angle steel *Z.L. Lv, X. Jiang, X.H. Qiang, H.L. Wu, J.M. Ding*	Decentralized control-based intervention policies for road networks *Y. Nakazato, D. Mizutani, T. Nagae*	Durability of residential construction in a marine environment *I.N. Robertson*	Analysis of mechanical behavior of bond between plain rebar and concrete *X. Gao, Y. Yu, C. Su, J. Li*	
Flexural behavior of prestressed concrete beams strengthened with external CFRP tendons *L.L. Chen, X.H. Qiang, X. Jiang, P. Liu*	Efficient early estimates of bridge interventions: costs, required possession times and associated failure risks *H. Mehranfar, B. T. Adey, S. Chuo, S. Moghtadernejad*	Multi-scale structural integrity assessment of a series of identical components in cultural-heritage structures: The case of the Clifton Suspension Bridge *R. De Risi, T. Moody, E. Voyagaki, S. Gunner, M. Pregnolato, N. Grilli, C. Taylor*	Residual bearing capacity of corrosion-damaged reinforced concrete columns with annular cross sections *Y. Jiang, Hua-Peng Chen, W.B. Li*	
Rehabilitation of cracked diaphragm cut-outs in steel bridge using Fe-SMA *Y.P. Wu, X.H. Qiang, X. Jiang, H.L. Wu, J.M. Ding*	Estimation of bridge component condition states with varying data availability *S. Chuo, B.T. Adey, H. Mehranfar, S. Moghtadernejad*	Robustness of RC girder bridges: the case of half-joint bridges *P. Martinelli, M. Colombo and M. di Prisco*	Steel liner corrosion and its effects on the leak-tightness of the nuclear containment structure *X.B. Li, X.Y. Wu, J.X. Gong*	
Numerical study on the mechanical behavior of Fe-SMA/steel hybrid joints based on cohesive zone modeling *Y. Shu, X.H. Qiang, X. Jiang, Q.L. Zhang, H.L. Wu*	State-of-the-art in the use of responsive systems for the built environment *J. Suo, C. Martani, A. G. Faddoul, S. Suvarna, V. K. T. Gunturu*	Life-cycle and evolution of tunnel equipment *G. Nodiroli, M. Katterbach, P. Klaus, D. Tillet*	Influence of combined corrosion of carbonation and cyclic loading on reinforced concrete beams *L.X. Zhu, Z.J. Zhou, Y.Q. Tian, C.R. Chen*	
Full-scale experimental study on strengthened riveted gusset joints *S. Wang, Q. Su, B. Liu, X. Jiang, L. Chen, C. Zhang*	Digital twins in construction practice – A use case driven implementation based on existing theory *T. Zinke, C.P. Schimanski, D. Schäfer, M. Rowsell, R. Schumann*	A methodology for the service life estimation of timber structures *D. Marranzini, G. Iovane, L. Cascini, R. Landolfo, M. Nicolella, B. Faggiano*	Structural response of corroded concrete columns with different rebar confinements under cyclic compressive loading *H. O. Aminulai, N. S. Ferguson, M. M. Kashani*	
Mechanical performance of steel plate combination beam bridge with clustered shear studs considering slip effect *YL. Yi, WY. Meng, NN. Huo, X. Ruan*	Advanced life-cycle assessment of reinforced concrete bridges using digital twin concept *J. Rymeš, J. Červenka, M. Herzfeldt, R. Pukl*	Development of digital rules for optimal auto-routing design of pipe *S.-E. Park, S.-W. Choi, E.-B. Lee*	Structural behaviour of axially loaded corroded low-strength RC columns with different confinement ratios *H. O. Aminulai, N. S. Ferguson, M. M. Kashani*	

Concurrent Technical Sessions | WeA-1 to WeA-5 — 14:30 - 16:30 | Wednesday Afternoon, July 5th, 2023

WeA-1 T.0.1 Room	WeA-2 T.0.2 Room	WeA-3 T.1.1 Room	WeA-4 T.1.2 Room	WeA-5 T.1.3 Room
Special Session:	Mini-Symposium:	General Session:	General Session:	Special Session:
Use of SHM and NDE for decision making	**Deconstruction and reuse of steel and lightweight metal structures**	**Experimental testing and structural modeling of bridges**	**Seismic performance assessment**	**Performance, safety, and cost of civil infrastructure in a life-cycle context**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
N.M. Apaydin	P. Kamrath	G. Sas	Y. Tsompanakis	Y. Li
F.N. Catbas	M. Kuhnhenne	M. Anghileri	L. Jafari	Y. Dong
The state-of-the-art in health monitoring of long-span cable supported bridges in Turkey *O. Çetindemir, A.C. Zülfikar, N. Memişoğlu Apaydın*	Requirements for gutting and demolition cost index *H. Kesting, M. Helmus*	Dynamic chain reaction analysis of a cable-stayed bridge by sudden loss of stays considering cable corrosion *Y. Aoki, H. Tsunoda, T. Akiyama, H. Gotou, S. Nakamura*	Lessons learned from past earthquakes for horizontally curved bridges *E. Namlı, T.Öztürk*	Masonry design for extended life-time usage by implementing joint behaviour *T. Molkens, J. Smits, S. Van Hout, R. Meuleman*
Informed assessment of structural health conditions of bridges based on free-vibration tests *M. Mazzeo, D. De Domenico, R. Santoro, G. Quaranta*	Numerical determination of the wrinkling stress of steel polyurethane sandwich panels for reuse scenarios *K. Janczyk, M. Kuhnhenne*	Performance assessment of existing prestressed concrete bridges utilizing distributed optical fiber sensors *H. Burger, T. Tepho, O. Fischer, N. Schramm*	Impact of as-recorded mainshock-aftershock excitations on seismic fragility of corrosion-damaged RC frames *E. A. Dizaj, M. R. Salami, M. M. Kashani*	Data-driven life-cycle risk assessment of bridge networks using Bayesian network *M. Cheng, H.O. Gao*
The effect of road roughness on vehicle-bridge interaction modeling *A. Aloisio, R. Alaggio, A. Contento, B. Briseghella*	Allowable strength estimation of vertical members used for system scaffolds considering reusability *N.G. Jang, J.H. Won, S.S. Ko, J.K. Bong, D.H. Chung*	Structural behavior of composite truss girder with thicker concrete deck at side span in a cable-stayed bridge *M.Y. Yang, C.S. Wang, Y.Q. Li, Y.C. Feng*	Seismic fragility analysis of nonuniformly corroded irregular RC bridges *E. A. Dizaj, M. R. Salami, M. M. Kashani*	Risk-based life-cycle loss assessment using statistical moments *Y. Zhang, Y. Li*
Influence of different debonding gap types on mechanical performance of axially compressed CFST stub columns with same debonding arc-length ratio *J.Q. Xue, J.P. Huang, L.Q. He, B. Briseghella, A. Contento*	Limits of reuse of steel *P. Kamrath*	Structural modeling, experimental testing and dynamic response of high-speed railway bridges *M. Anghileri, L. Capacci, F. Biondini, L. Bernardini, C. Somaschini, M. Belloli*	Seismic performance evaluation of masonry infilled RC frame retrofitted with BRBs *R. Chelapramkandy, J. Ghosh, F. Freddi*	Effects of high temperature on web crippling strength of lean duplex stainless steel tubular sections *Y. Cai, C. C. Lee, S. L. Mak, L. Wang, F. Zhou*
Dynamic assessment of a stress-ribbon CFST arch bridge with SHM and NDE *J.P. Huang, L.Q. He, J.Q. Xue, S.N. Zhou, B. Briseghella, C. Castoro, A. Aloisio, G. C. Marano*	The deconstruction of a steel based single story hall *P. Kamrath*	Temperature effect on static and quasi-static bridge measurements *K. Dakhili, T. Kebig, M. Schäfer, M. Maas, M. Bender, A. Zürbes*	Sensitivity of the seismic response to the modelling variables defining constitutive models of reinforced concrete frames *G. Karaki*	Risk-based fatigue assessment of orthotropic steel decks *J. Heng, Y. Dong, C. Baniotopoulos, S. Kaewunruen*
Bridge maintenance prioritization by using multi-criteria decision analysis *H.Silimanotham, M.Henry*	On the development of regulations for the increased reuse of steel structures *H. Bartsch, F. Eyben, J. Voelkel, M. Feldmann*	Structural model updating of an existing concrete bridge based on load testing and monitoring data *A. Agredo Chávez, J. Gonzalez-Libreros, L. Elfgren, G. Sas, L. Capacci, F. Biondini*	A non-Gaussian algorithm to simulate the earthquake motion phase difference *T. Sato*	Life-cycle management of offshore wind deteriorating structures under ship collision accidental events *P. Salazar L., J. Moran A., P. Rigo, P. G. Morato*
Continued	*Continued*	*Continued*	*Continued*	*Continued*

Concurrent Technical Sessions | WeA-1 to WeA-5				14:30 - 16:30 | Wednesday Afternoon, July 5th, 2023
WeA-1 T.0.1 Room	**WeA-2 T.0.2 Room**	**WeA-3 T.1.1 Room**	**WeA-4 T.1.2 Room**	**WeA-5 T.1.3 Room**
Special Session:	Mini-Symposium:	General Session:	General Session:	Special Session:
Use of SHM and NDE for decision making	**Deconstruction and reuse of steel and lightweight metal structures**	**Experimental testing and structural modeling of bridges**	**Seismic performance assessment**	**Performance, safety, and cost of civil infrastructure in a life-cycle context**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
N.M. Apaydin	P. Kamrath	G. Sas	Y. Tsompanakis	Y. Li
F.N. Catbas	M. Kuhnhenne	M. Anghileri	L. Jafari	Y. Dong
Continued	*Continued*	*Continued*	*Continued*	*Continued*
Application of Infrared Thermography in civil engineering: limits and drawbacks *D. Meloni, G. Sechi, G. Concu*	RFID-based traceability system for constructional steel reuse *P. Hradil, K. Jaakkola, K. Tuominen*	Demolition of a 65-year-old box-girder prestressed concrete bridge located in Northern Sweden *C. Al. Daescu, J. Gonzalez-Libreros, C. Wang, L. Elfgren, G. Sas, L. B. Nilsson, T. Larsson, P. Simonsson*	Assessment of energy redistribution of structural collapse under seismic loads using wavelet transforms *N. S. D. Farhan , J. Lu , W. A. Altabey, Z. Wu, A. Silik, M.Noori*	Seismic safety assessment of "Palácio do Itamaraty" at Brasília reliability-based *P.Q Rodrigues, J.C. Pantoja, P.S.T. Miranda*
	Environmental and economic impact of steel industrial buildings made of reclaimed elements *R. Buzatu, V. Ungureanu, P. Hradil*	Failure analysis of ageing RC bridges: the cases of the Polcevera viaduct and the Caprigliola bridge *N. Scattarreggia, A. Orgnoni, G.M. Calvi, R. Pinho, D. Malomo, M. Moratti*	Nonstructural performance improvements for seismic resilience enhancement of modern code-compliant buildings *M. R. Joo, R. Sinha*	

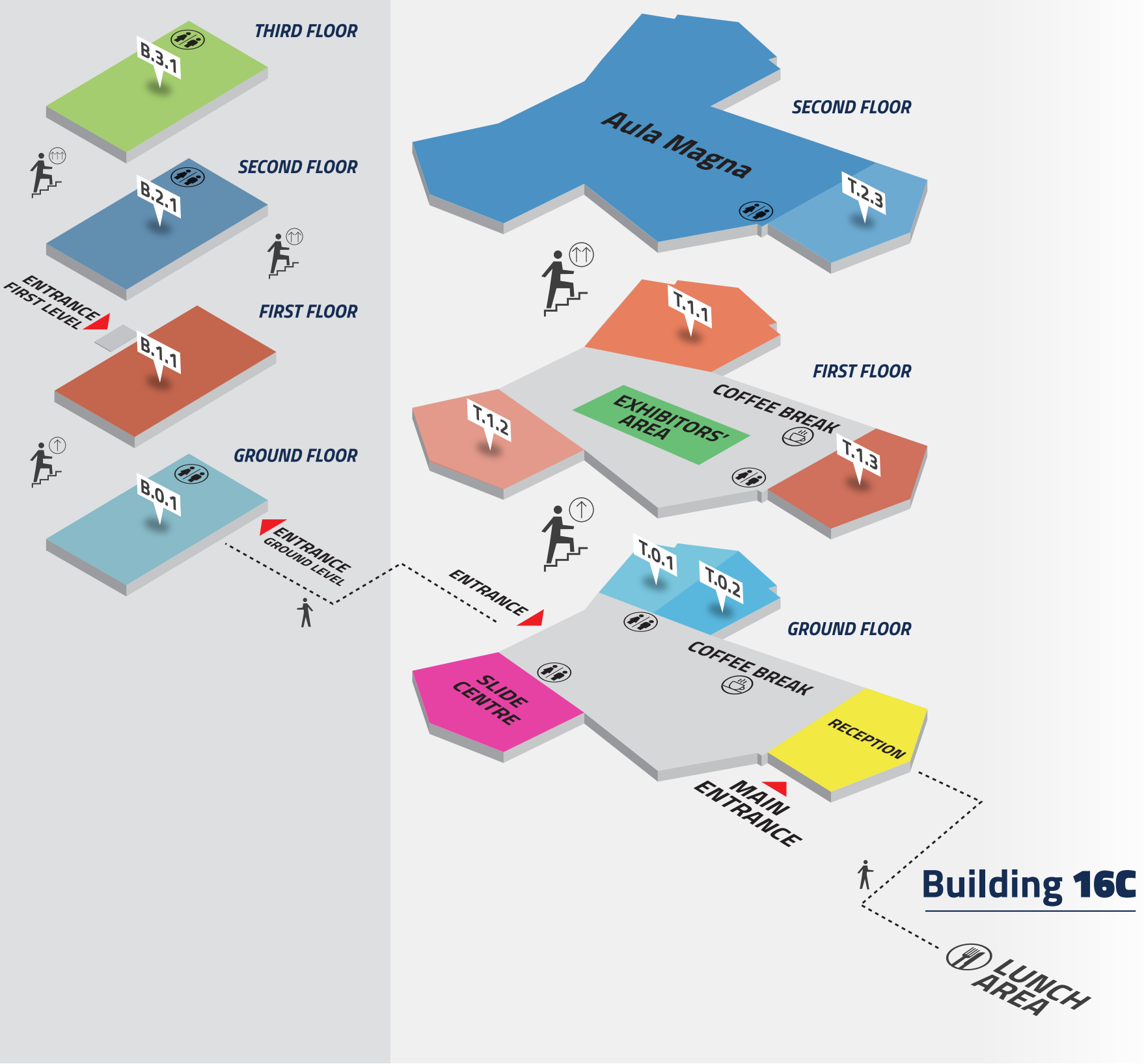
Concurrent Technical Sessions | WeA-6 to WeA-10 — 14:30 - 16:30 | Wednesday Afternoon, July 5th, 2023

WeA-6 T.2.3 Room	WeA-7 B.0.1 Room	WeA-8 B.1.1 Room	WeA-9 B.2.1 Room	WeA-10 B.3.1 Room
General Session:	Mini-Symposium:	Special Session:	General Session:	General Session:
Testing and diagnostics	**Safety and durability of high-performance structures**	**Data management and analysis for predictive maintenance of aging infrastructure**	**Life-cycle-oriented computational tools**	**Life-cycle assessment of materials and components**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
F. Tondolo	X. Gu	F. Schmidt	K. Kawamura	D. Novak
T. Imai	Q. Yu	L.F.M. Sanchez	L. G. Rodrigues	H. Yáñez-Godoy
A basic study on the evaluation of the protective effect of silane-based impregnation on mortar using electrochemical impedance spectroscopy *S. Nagaoka, K. Nakayama, M. Iwanami*	Evolution of seismic fragility of reinforced concrete columns subjected to corrosion *Y. Liu, W. Zhang, X. Gu, Y. An*	Weather condition effect on the road surface friction: A Preliminary assessment based on sensor data *M. Rasol, F. Schmidt, S. Ientile*	Predicting the military load class from bridge data with a multilayer perceptron *M. Haslbeck, J. Flotzinger, Th. Braml*	Life-cycle assessment of concrete hollow blocks and autoclaved aerated concrete blocks *J.M. Ongpeng, M.V. Umali*
Super resolution of multi-channel ground penetrating radar volume data by zero-interpolated 3D kirchhoff migration *T. Imai, T. Mizutani*	Experimental study on water absorption in unsaturated concrete *J. Fang, C. Jiang, X.L. Gu*	Prediction of recovery time of infrastructure functionalities after an earthquake using machine learning *B. Derras, N. Makhoul*	Elaboration of a truncated probability function for the Young's modulus of concrete *M. Haslbeck, Th. Braml*	Positive effects of aligned steel fiber using the electro-magnetic field on flexural behavior of reinforced UHPC beams *Y.M. Xiong, M. Yang, H. Shi, J. Zhao*
Soundness evaluation of small-scale bridge decks with portable FWD tests *T. Sasaki, A. Tsuboi, Y. Sugimoto, H. Kakeda, H. Onishi*	Monitoring electrochemical chloride extraction process by testing chloride ion contents in electrolyte *C. Song, C. Jiang, X.L. Gu*	Condition assessment and management protocols for concrete infrastructure affected by internal swelling reactions: challenge and research needs *R. Medeiros, A. Bergmann, L. Sanchez*	Inclusion of Stochastic Petri-net models on a risk-based tool for the maintenance of road drainage systems *L. G. Rodrigues, L. C. Neves, J. Wallis, R. Brook, K. Morosiuk*	Experimental study on quantification of carbon dioxide adsorption by different cement types and mix proportions *T. Iyoda, E. Ishikawa, Y. Ikeo*
Rut depth estimation by distortion analysis of images taken by an in-vehicle camera *W. Gao, K. Xue, T. Nagayama, B. Zhao, D. Su, K. Xue, B. Zhao*	Experimental study on stress recovery behavior of Fe-SMA subjected to multi-activation *Q.Q. Yu, Z.Y. Chen, X.L. Gu, X.W. Xiao, W.P. Zhang, Y.H. An,*	The efficiency of laboratory test procedures for assessing field performance of concrete against alkali-aggregate reaction (AAR) *A. Bergmann, R. Medeiros, L. Sanchez*	High performance computing methods for concrete surface damage identification and prevision in service highways tunnel concrete linings *I. Vangelisti, C. Beltrami, G. Rozza*	Research on the anti-sliding performance of cable clamps in an irregular elliptical suspen-dome structure *H.J. Wang, X.D. Ren, S.W. Xiao, L. Li, B. Luo*
Research on imaging technology of concrete bridge bottom apparent disease detection based on machine vision *S.G. Cao, X.Y. Li, Y. Pan, J.L. Fu, H. Tian*	SMFL-based probability distribution of minimum cross-sectional areas of corroded steel bars *J.L. Qiu, W.P. Zhang, Q.Q. Yu, Z.P. Chen*	Digital Twins for civil infrastructure: a case study on the Clifton Suspension Bridge (Bristol, UK) *M. Pregnolato, S. Gunner, E. Voyagaki, R. De Risi, G. Gavriel, P. Tully, N. Carhart, T. Tryfonas, C. Taylor*	Using shape optimization and principal stress line based stiffness improvement of thin-shell structure and reduce construction costs *Y.X. Sun, Y.Y. Yang, L.J. Leu, K. Yamamoto*	Life-cycle assessment of buried water-transmission concrete mains *H. Yáñez-Godoy, S. M. Elachachi*
Assessment of mechanical properties for ancient timber through visual and ND methods *S. Verre, G. F. Cauteruccio, G. Fortunato, A. A. Zappani, L. Ombres, M. Brunetti, M. Nocetti, N. Ruggieri, M. Togni, D. Marranzini, G. Iovane, B. Faggiano*	Reliability analysis considering epistemic uncertainties with small initial sample and successive updating data *Y. Fei, Y. Jiang, Y. Leng, L. Wang, Z. Chen*	SHM analysis for damage detection using time series analysis methods *F. Schmidt, F. Chabi, J.-F. Bercher*	Simulation of chloride ingress into aging surface-coated concrete *C. Yoshii, F. Biondini, M. Iwanami, K. Nakayama*	Life-cycle assessment and sensitivity analysis of a clayey sediment-based geopolymer concrete *L. Monteiro, H. Yáñez-Godoy, J. Saliba, N. Saiyouri*
Continued	*Continued*	*Continued*	*Continued*	*Continued*

Concurrent Technical Sessions | WeA-6 to WeA-10				14:30 - 16:30 | Wednesday Afternoon, July 5th, 2023
WeA-6 T.2.3 Room	**WeA-7 B.0.1 Room**	**WeA-8 B.1.1 Room**	**WeA-9 B.2.1 Room**	**WeA-10 B.3.1 Room**
General Session:	Mini-Symposium:	Special Session:	General Session:	General Session:
Testing and diagnostics	**Safety and durability of high-performance structures**	**Data management and analysis for predictive maintenance of aging infrastructure**	**Life-cycle-oriented computational tools**	**Life-cycle assessment of materials and components**
Chairs:	Chairs:	Chairs:	Chairs:	Chairs:
F. Tondolo	X. Gu	F. Schmidt	K. Kawamura	D. Novak
T. Imai	Q. Yu	L.F.M. Sanchez	L. G. Rodrigues	H. Yáñez-Godoy
Continued	*Continued*	*Continued*	*Continued*	*Continued*
A review on electrodeposition repair of cracked reinforced concrete *Q. Zhang, Q. Chen, H. Yang*	Numerical simulation of freeze-thaw damage deterioration of concrete in cold region *J. Jiang, Y. Wang, Z. Liu, Z.Chen*	A service value predictive system of componentized infrastructure assets *K. Petroutsatou, T. Vagdatli, M. Voutsis, P. Panetsos, Z. Barmpa*	Numerical simulation of non-Fick moisture diffusion of pultruded GFRP bolt connection *Y. Sun, Y. Liu, X. Wang, H. Xin*	Stress-strain relationship of loaded concrete considering freeze-thaw damage gradient *X. Liu, Y. Lei, D. Niu, Y. Wang, Z. Dong*
Study on the applicability of repairing rubber bearing covers by resurface vulcanization in the field *A. Matsumoto, R. Takahara, T. Imai, W. Abe*	Smart aggregate-based automated concrete stress monitoring via deep learning of impedance signals *J.T. Kim, Q.B. Ta, Q.Q. Pham, N.L. Pham, T.C. Huynh*		3-D segmentation of concrete spalling in point cloud using unsupervised clustering and plane fitting *Y. Zhang, B. Xia*	

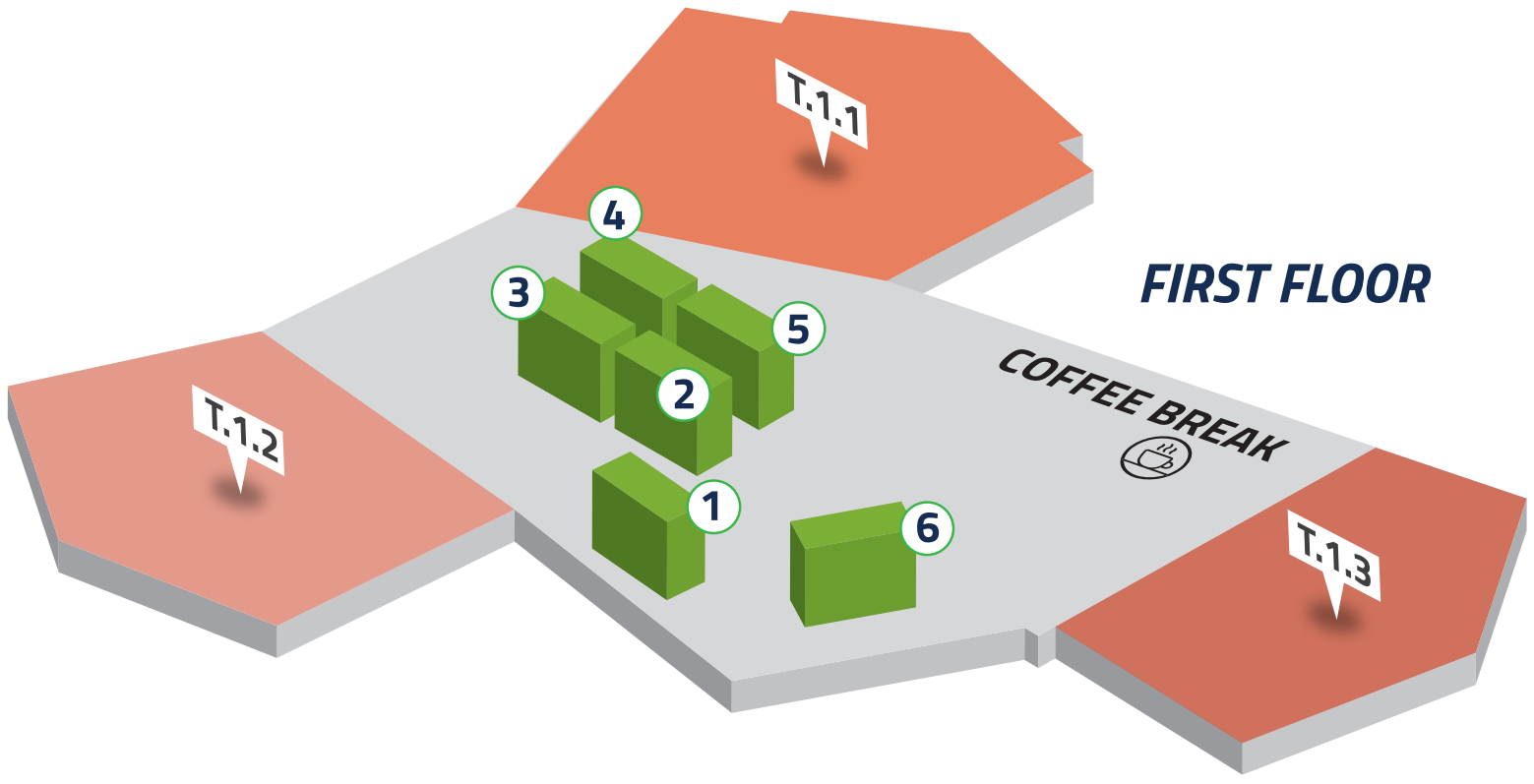
Map of the Symposium Venue

The Symposium will be held in the Trifoglio (Clover) building facilities originally designed by Gio Ponti and recently renovated and expanded based on a project by Renzo Piano. The Symposium venue includes Building 13 (Plenary Sessions, Parallel Sessions, Exhibition, and Coffee Breaks), Building 16B (Parallel Sessions), and Building 16C (Lunch Area).



Exhibition

Exhibition booths are made available at IALCCE 2023. The Exhibition area is located at the First Floor of Building 13 - Trifoglio.



1. LOMBARDI
2. ATENA
3. BRIDGE|50
4. IALCCE
5. FIELD
6. VISION

Social Program

The Symposium Social Program includes Welcome Reception, Gala Dinner, and Post-Symposium Technical Tours. These events are offered to all registered Symposium Delegates and Accompanying Persons.

WELCOME RECEPTION

Rectorate Building and Gardens | Leonardo Campus | Politecnico di Milano

Sunday, July 2nd, 2023 | 19.00 - 22.00

The Welcome Reception will be held in the Rectorate Building and Gardens of the Leonardo Campus of Politecnico di Milano.

GALA DINNER

Cascina San Carlo | Caravaggio (BG)

Tuesday, July 4th, 2023 | 19.30 - 23.30

Cascina San Carlo is a corner of peace between nature and fairy tale that preserves the atmosphere of the traditional farmhouses of the Po Valley. The large central courtyard surrounded by arcades, the garden with fountains and water games, the tolling of the bells and the internal rooms with large windows are just some of the ingredients of this picturesque venue. After a welcome aperitif served in the gardens and courtyard, the Gala Dinner will be hosted in the covered square, dedicated to Caravaggio, softened by a large central fountain and sixteen ball lamps, characterized by large windows overlooking the verdant countryside surrounding Cascina San Carlo. The program of the Gala Dinner will include the IALCCE 2023 Awards Ceremony.

TECHNICAL VISITS

Post-Symposium Technical Tours are scheduled on July 6th, 2023, and offered to all registered Symposium Delegates and Accompanying Persons.

Post-Symposium Technical Tours

The following Post-Symposium Technical Tours are organized for registered Delegates and Accompanying Persons on Thursday, July 6th, 2023.

Tour #1: Duomo's Building Site

Tour #2: BRIDGE|50 Testing Site

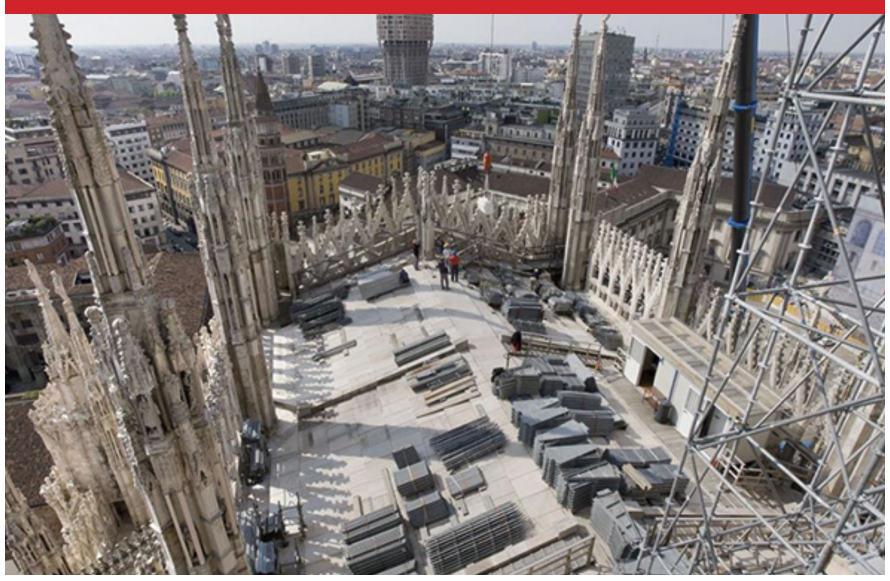
The Tours will include technical visits and complementary cultural activities such as: Duomo Cathedral, Museum of the Duomo & Ambrosian Library in Milan (Tour #1); Egyptian Museum in Turin (Tour #2).

Symposium Delegates who wish to participate in the Post-Sympsium Technical Tours are requested to access the online Symposium Management System, choose the Tour they wish to participate in and the departure group they would like to join. The registered Accompanying Person who has applied to participate in the Post-Symposium Technical Tour will be added to the group chosen by the Symposium Delegate.

Limited capacity may apply for the Post-Symposium Tours. Therefore, as mentioned in the Registration webpage, Symposium registration does not guarantee attendance. The available slots will be reserved to registered participants on a first-come first-served basis. The deadline for booking the Post-Symposium Tours is June 25th, 2023. Beyond this deadline, bookings will be subject to availability.

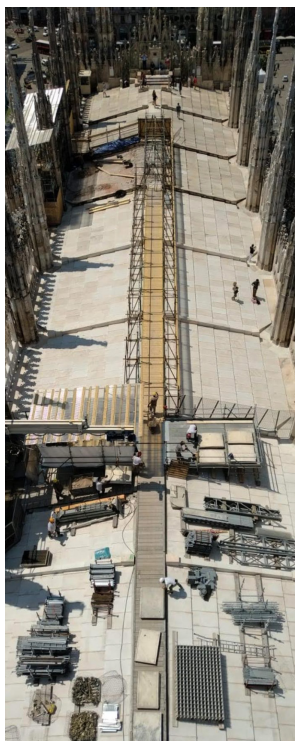
Should you have any inquiry about these Tours, please contact the Organizing Secretariat via email at secretariat@ialcce2023.org

TECHNICAL TOUR #1
DUOMO'S BUILDING SITE



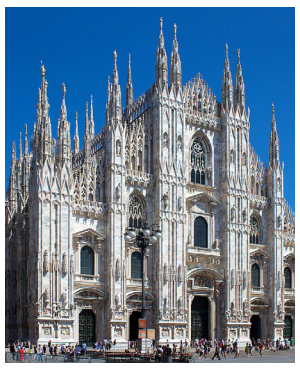
TECHNICAL TOUR #2
BRIDGE|50 TESTING SITE

TECHNICAL TOUR #1: DUOMO'S BUILDING SITE



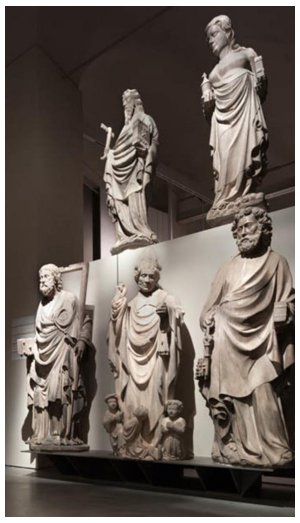
THE DUOMO'S BUILDING SITE: WHERE SCAFFOLDING REACHES THE SKY

The cathedral's construction site is located at the cathedral itself to allow workers to work on the monument. Starting from the "cesata" located on the south side of the cathedral, they go up to a maximum height of 108.5 metres. Till today, it is the centre of important activities: restoration and conservation of stone structures, installation and update of technological systems, laying of ornaments and structures from the Marble Yard, installation of stained glass, paintings, wooden and metal artefacts ensuring the efficiency of the grand original complex, arranging liturgical vestments and furnishings and contributing to ensuring the dignity of religious services and of the entire cathedral. It is on this large, complex and evocative site that the qualified workers of the Veneranda Fabbrica, often on very high scaffolding, sometimes supported by external professionals. On this extraordinary construction site bricklayers and marble workers, carpenters and blacksmiths, electricians and carpenters, restorers and operators, all led by the technicians in charge, commit their skills and experience handed down and accumulated from generation to generation. These ancient "trades" are always evolving, thanks to the contribution of new technologies, the result of continuous scientific research, of which the Veneranda Fabbrica has availed itself.
While walking around the Tiburio base, guided by the engineers who manage and survey the Cathedral's continuous maintenance works, this Technical Tour will allow a close look at the overall process. The results of the six-monthly inspections give the opportunity of a fine tuning on the three years based structural maintenance program. Scaffolding is then assembled and the Veneranda Fabbrica's employees can at least operate: a 637 years old commitment, progressively helped by up-to-date technology.



DUOMO CATHEDRAL

The Duomo is one of the most famous and complex Gothic constructions of the world. As dimensions, it is the second highest church of the world after the cathedral of Beauvais in France, and the third greatest cathedral after St.Peter in Vatican and the cathedral in Seville.
A complex of 135 spires and 3200 statues, crammed onto the roof and into the facade, adorn the exterior of this vast cathedral. In particular, the central spire is capped by a golden statue, called Madonnina, literarily "little Madonna", traditionally considered the Milan's protector.
The interior of the Cathedral, organized into five aisles divided by majestic pylons, contains a collection of beautiful and sacred pieces of art donated by wealthy noblemen and patrons over the centuries.



MUSEUM OF THE DUOMO & AMBROSIAN LIBRARY

The Museum, with its approximately 2,000 m² of floor space and 26 rooms, collects the Treasure of the Cathedral and works of art from the cathedral and from the Veneranda Fabbrica's storerooms. The pieces in the collection are placed in a chronological itinerary that allows visitors to discover the construction phases of the cathedral, from its foundation in 1386 to the 20th century.
The Ambrosian Library, founded by Cardinal Federico Borromeo on September 7, 1607 and inaugurated on 8 December 1609, was one of the earliest libraries to grant access to all who could read and write. It was conceived by its founder as a centre for study and culture. The Library is one of the most important in the world.
Its collections numbers more than a million printed volumes (including thousands of incunabula and books dating from the 16th century); nearly 40,000 manuscripts (including the celebrated Codex Atlanticus and some of the most important existing manuscripts) in Italian, Latin, Greek, Arabic, Syriac, Ethiopic (and much else); 12,000 drawings (among them works by Raphael, Pisanello, Leonardo and other renowned masters); 22,000 engravings; and other unique rarities (old maps, musical manuscripts, parchments and papyri).

Tour Scheduling

	GROUP 1	GROUP 2	GROUP 3
Technical Visit to the Cathedral's Construction Site	9.00 am	9.20 am	9.40 am
Visit to the Terraces and Cathedral	10.30 am	10.50 am	11.10 am
Free time for lunch	12.00 pm	12.20 pm	12.40 pm
Visit to the Museum of the Duomo	2.00 pm	2.30 pm	3.00 pm
Moving from Museum of the Duomo to the Ambrosian Library	3.00 pm	3.30 pm	4.00 pm
Visit to the Ambrosian Library	3.30 pm	4.00 pm	4.30 pm
End of the Tour	4.30 pm	5.00 pm	5.30 pm

	GROUP 4	GROUP 5	GROUP 6
Visit to the Terraces and Cathedral	9.00 am	9.20 am	9.40 am
Technical Visit to the Cathedral's Construction Site	10.40 am	11.00 am	11.20 am
Free time for lunch	12.00 pm	12.20 pm	12.40 pm
Visit to the Ambrosian Library	2.00 pm	2.30 pm	3.00 pm
Moving from the Ambrosian Library to the Museum of the Duomo	3.00 pm	3.30 pm	4.00 pm
Visit to the Museum of the Duomo	3.30 pm	4.00 pm	4.30 pm
End of the Tour	4.30 pm	5.00 pm	5.30 pm

TECHNICAL TOUR #2: BRIDGE|50 TESTING SITE

BRIDGE|50 RESEARCH PROJECT

BRIDGE|50 is a research project aimed at investigating the residual structural performance of a 50-year-old concrete bridge recently dismantled in Italy.
The research activity is carried out jointly by Politecnico di Milano and Politecnico di Torino and the project partners include several public authorities and private companies.
The project involves a wide experimental campaign of non-destructive testing and full-scale load tests on a group of 29 prestressed beams and two pier caps moved and stored in a testing site located in the Mirafiori campus of Politecnico di Torino. The planned activities include photographic mappings, drone surveys, non-destructive testing, full-scale load tests, and extraction of a large number of material samples from the tested structural elements for laboratory tests.
This Technical Tour will include both an introductory presentation and a guided visit of the testing site aimed at providing an overview of the structural members under investigation along with an in-depth description of the ongoing experimental activities and recent outcomes of the project.

BRIDGE|50
RESEARCHPROJECT

EGYPTIAN MUSEUM

The Museo Egizio (Egyptian Museum) is an archaeological museum in Turin specializing in Egyptian archaeology and anthropology.
It houses one of the largest collections of Egyptian antiquities, with more than 30,000 artifacts, and is considered the second most important Egyptology collection in the world, after the Egyptian Museum of Cairo. Discover 4000 years of history, archeology, and art.

Tour Scheduling

	GROUP 1	GROUP 2
Departure from Politecnico di Milano	7.30 am	8.30 am
Arrival at Politecnico di Torino | Mirafiori Campus	9.45 am	10.45 am
BRIDGE|50 Introductory Lecture	10.00 am	11.00 am
Visit of the BRIDGE|50 Testing Site	10.45 am	11.45 am
Departure for Turin Downtown	12.00 pm	1.00 pm
Free time for lunch	12.30 pm	1.30 pm
Guided Tour of Egyptian Museum – Subgroup Entry A	2.00 pm	3.00 pm
Guided Tour of Egyptian Museum – Subgroup Entry B	2.10 pm	3.10 pm
Guided Tour of Egyptian Museum – Subgroup Entry C	2.20 pm	– – –
Guided Tour of Egyptian Museum – Subgroup Entry D	2.30 pm	– – –
Departure from Turin	4.15 pm	5.00 pm
Arrival at Politecnico di Milano	6.30 pm	7.15 pm

Program for Accompanying Persons

The Symposium Social Program includes the attendance of Welcome Reception on July 2nd, Gala Dinner on July 4th, and Post-Symposium Tours on July 6th. These events will be offered to all registered Symposium Delegates and Accompanying Persons.

Optional Tours for Accompanying Persons, Family and Friends of Symposium Delegates have been also organized. The Optional Tours will require a separate registration.

OPTIONAL TOURS

THE THOUSAND FACES OF MILAN

July 3rd, 2023

Milan is a modern, rational, cosmopolitan city which nevertheless conserves its Lombardy character that “starts” to become romantic as soon as its stops being practical. The mainly modern appearance of Milan hides the fact the city has extremely important works of art and architecture. Milan has changed its face many times over the centuries, nevertheless in its historical heart it is possible to find traces of its glorious past. History, art, beauty, curiosities and anecdotes unknown to most. This tour will introduce you to the most beautiful treasures of the historical centre of Milan.

The first part of the Tour will be dedicated to discover the Basilica of St. Ambrogio, the Duomo Cathedral, and the La Scala Theatre, the monumental symbols of the city. The remaining part of the guided Tour will also include visits to the Fashion District and the Navigli District with Boat Tour.

Tentative Tour Scheduling

9.30 am	Departure from PoliMi with private guide(s)
10.00 am	Visit the Basilica of Sant’Ambrogio and downtown walking route
10.45 am	Visit the Duomo Cathedral
11.20 am	Visit La Scala Theatre
12.05 pm	Promenade in the Fashion District
12.30 pm	Free time for lunch
2.30 pm	Move to Navigli District
3.20 pm	Boat Tour Navigli
4.30 pm	Walking tour Navigli
5.30 pm	Departure from Navigli District
6.00 pm	Arrival at PoliMi

VARENNA AND THE MAGNIFICENT VILLAS OF LAKE COMO

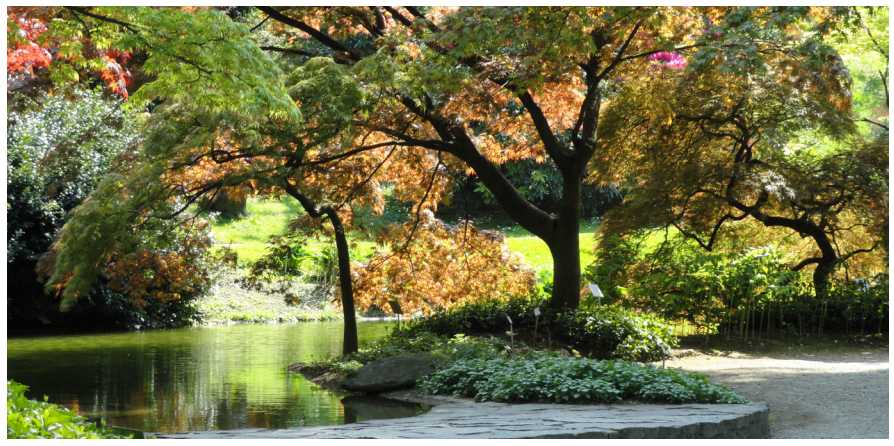
July 4th, 2023

Lake Como, the third largest lake in Italy, attracts visitors from all around the world thanks to the beauty of its environment, so poetically described by Alessandro Manzoni in his masterpiece “I Promessi Sposi” (“The Betrothed”). A unique perspective able to join the picturesque and colorful villages, the magnificent ancient villas and their flowering gardens located on the shores, is assured moving by boat.

The fascination of Lake Como mainly arises from the small characteristic villages and the ancient magnificent residences situated along the shores, each one having its own peculiarities. This tour offers the opportunity of discovering some of the most famous villas of Lake Como.

Tentative Tour Scheduling

7.15 am	Departure from Milan by bus and arrival at Varenna
9.00 am	Meet up with the guide and visit of Varenna
9.30 am	Visit of Villa Monastero in Varenna
11.10 am	Take the Ferry Boat (Traghetto) to Bellagio
11.30 am	Visit of Villa Melzi d’Eril in Bellagio
1.00 pm	Free time for lunch in Bellagio
2.00 pm	Take the Public Boat (Battello) to Villa Carlotta
2.20 pm	Visit of Villa Carlotta in Tremezzo
4.00 pm	Departure from Villa Carlotta by bus
6.00 pm	Arrival at Milan



MILAN'S JOURNEY THROUGH TIME FROM 14th TO 19th CENTURY

July 5th, 2023

This tour will allow to discover the gothic and reinaissance art of Milan.

The Gothic style was born in the 12th century in France and it continued til the 14th century. It spreaded to all Europe and it reached Italy too. In the 14th century Milan came under the Visconti family and it became the international centre of gothic art. The term "gothic" was used for the first time by Giorgio Vasari in the 16th century as a synonym of "barbarous", in contrast with the retrieval of the ancient greek–roman language of the Renaissance.

The term "renaissance" indicate the art of the 15th and 16th centuries, and it is used to describe all the artistic changes, that occurred after the Middle Ages. In this way renaissance means a revival of the classical period, and a new interest towards the ancient Roman and Greek civilization. In fact the renaissane artists inspired themselves from the classical art to create something new. In the 15th century Milan came under the Sforza family and Ludovico il Moro, the ruler of the city, decided to surround himself by the most important artists of the period.

The first part of the Tour will be dedicated to discover San Maurizio al Monastero Maggiore, Castello Sforzesco, and Santa Maria at San Satiro, the major examples of Gothic – Renaissance art. The remaining part of the guided will also include visits through the ancient Brera district and its art gallery.

Tentative Tour Scheduling	
9.30 am	Departure from PoliMi with private guide(s)
10.00 am	Visit San Maurizio al Monastero Maggiore
11.00 am	Visit the Sforza Castle
12.00 pm	Visit Santa Maria at San Satiro
12.30 pm	Lunch and free time
2.30 pm	Move to Brera District
3.30 pm	Visit the Pinacoteca Art Gallery
4.20 pm	Walking tour of Brera District
5.30 pm	Departure from Brera District
6.00 pm	Arrival at PoliMi

Transportation & Local Info

International Airports

Milan is served by three airports – Milan Malpensa, Milan Linate, and Orio al Serio International Airport (Bergamo) – which ensure frequent domestic and international connections. Facilities available at all the airports include tourist information offices and car rental services.

Milan Malpensa Airport

The airport of Milano Malpensa, the largest in the Milan area, has two terminals that offer many intercontinental connections, on top of numerous domestic and international routes. The airport is well connected with the city of Milan: the journey by car takes about an hour along the A8 motorway (Milano-Laghi, Varese direction, Busto Arsizio-Malpensa junction). Moreover, the international hub is conveniently connected with the town by private shuttle bus services to Centrale Railway Station and express train services to Cadorna Railway Station.

https://www.milanomalpensa-airport.com/en/from-to/getting-to-leaving-from-malpensa

Milan Linate Airport

The Milan Linate airport, named after Enrico Forlanini, is a first-rate city airport. The airport of Milan Linate is conveniently connected to the city of Milan by private shuttle bus services to Centrale Railway Station and the urban bus line no. 73 to Piazza San Babila.

https://www.milanolinate-airport.com/en/from-to/getting-to-leaving-from-linate

Orio al Serio Airport

The International Airport of Orio al Serio is the third airport of Milan. It is located close to Bergamo, about an hour away from the centre of Milan. Orio al Serio is conveniently connected with the city of Milan by private shuttle bus services to Centrale Railway Station.

https://www.milanbergamoairport.it/en
https://www.milanbergamoairport.it/en/bus

PoliMi

How to Get to Leonardo Campus of Politecnico di Milano

The Symposium venue is located in the Leonardo Campus of Politecnico di Milano and it can be easily reached from Centrale Railway Station and Cadorna Railway Station by taxi or public transportation.

The main entrance of the Leonardo Campus is located in Piazza Leonardo da Vinci 32, just 2-minute walking distance from the Piola subway station (Line 2 – Green). The Symposium will be held in the Trifoglio (Clover) building facilities.

Milan has an efficient and extensive public transport system. Information about public transport in Milan and how to move around the city, including maps, timetables, tickets, real time information and more, can be found on the ATM website.

http://www.atm.it/en

https://www.atm.it/en/ViaggiaConNoi/PublishingImages/schema%20rete%20metro.jpg

Taxies in Milan

Contrary to most cities in Europe, taxis in Milan rarely stop when someone hails them in the street. To catch a cab, you'll need to walk to the nearest taxi stop or, otherwise call to book one in advance. There are many Radio Taxi companies in Milan. A taxi cab can be reserved through a variety of web/phone channels, including the following Radio Taxi services:

+39 02 4040 | +39 02 8585 | +39 02 6969

Local Info

Weather

July is a warm summer month in Milan, with temperature in the range of an average high of 29°C (84°F) during the day and an average low of 18°C (64°F) during the night.

Currency

The currency in Italy is the Euro. You can exchange currency in banks, exchange offices, airports and hotels. For daily exchange rates, please visit the website of the Bank of Italy.

https://tassidicambio.bancaditalia.it/terzevalute-wf-ui-web

If you do not want to exchange your currency, you can use credit or debit cards. MasterCard and Visa are widely accepted by most merchants. A little cash is however recommended for small expenses. Coins are available in €2 and €1. Paper notes are available in the same denominations as the US dollar up to the €500 (€5, €10, €20, €50, €100, €200, €500).

Time Zone

Italy in July observes the Central European Summer Time (CEST, UTC+2), lasting from the last Sunday in March to the last Sunday in October and one hour ahead the Central European Time (CET, UTC+1).

Electricity

Electricity in Italy is 220 volts, 50 cycles alternating current (AC). Italian sockets are designed to accept round pins.

Notes

Notes

IALCCE2023

EIGHTH INTERNATIONAL SYMPOSIUM ON LIFE-CYCLE CIVIL ENGINEERING

Politecnico di Milano

Italy | **July 2-6**, 2023